THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVIII. No. 692.] LONDON, AUGUST 15, 1876. [28TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—12,000 cubic feet of gas per ton of coal: 28-candle gas; coke 66·70 per cent.; volatile matters 33·30 per cent. Coke of good quality.

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SPECIAL GASOMETER PAINT
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Presented by Her Majesty's Government to the French Government,
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Warranted to Measure correctly & not to vary.

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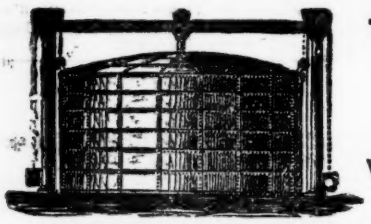

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ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

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And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

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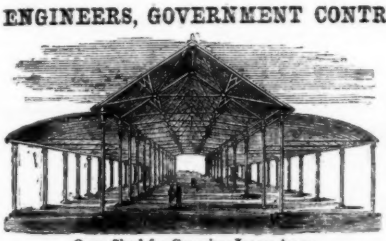

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For which Estimates will be given on application,

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EITHER WITH

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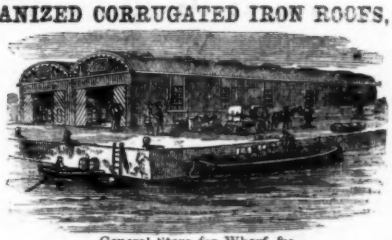

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The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

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SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

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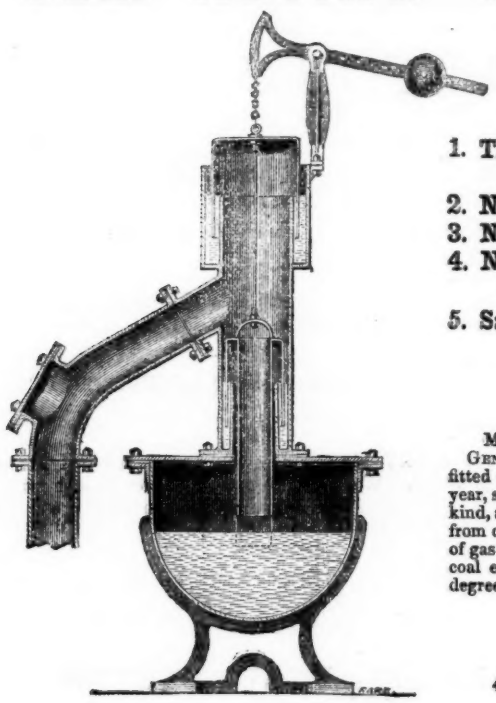

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Tenby Gas-Works, March 29, 1876.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—In reply to your inquiry, I have to say that all the retorts at these works are fitted with your Self-Acting Patent Dip-Pipes. They have been in use now for more than a year, some for more than two years. They have never required repair or attention of any kind, and work admirably. By the use of these removable dips the retorts are kept quite free from carbon, the charges burn off more quickly than before they were adopted, and the yield of gas is increased. We get regularly a weekly and monthly average yield of gas per ton of coal exceeding 10,400 feet of 14-candle gas, and I attribute this excellent result in no small degree to the use of these Self-Acting Removable Dip-Pipes.

I am, gentlemen, yours faithfully,

(Signed) EDMUND H. STEVENSON.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

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Attention is called to their Dry Meters in Wood Cases, as used by the principal London Gas Companies. These Meters are especially suitable for seaport towns and for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

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INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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STATION-METERS OF ALL SIZES, with PLANED JOINTS;

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

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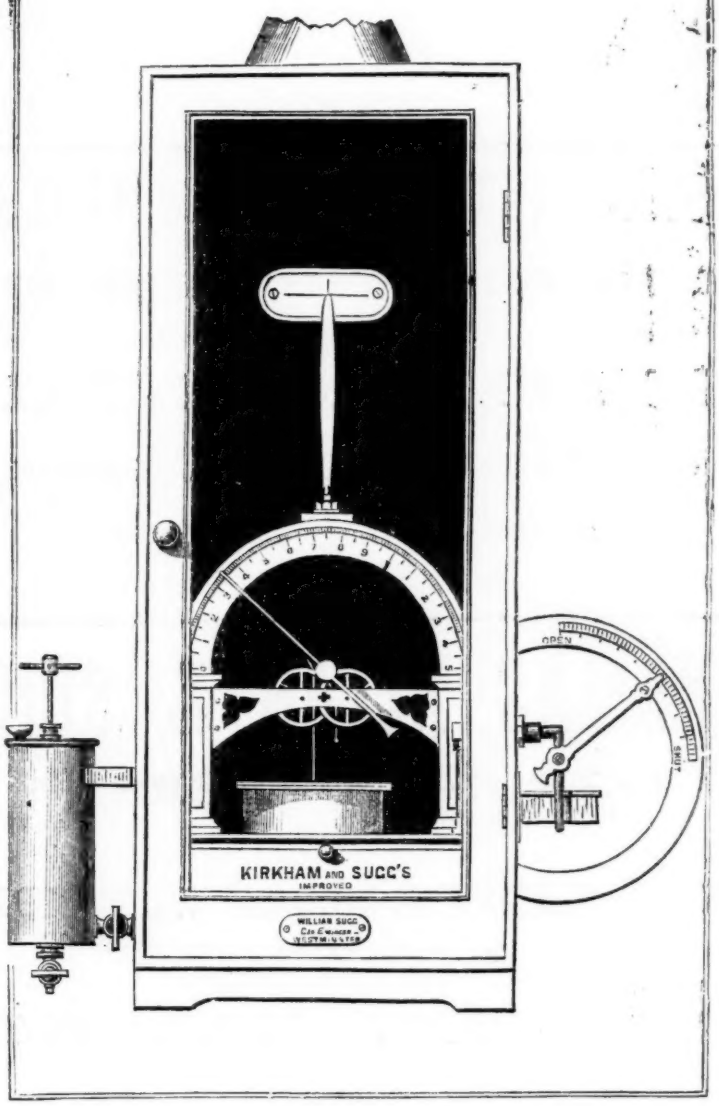
Photometers,

which do not require a Dark Room, with every Fitting accurately made to Gauge, French Polished Bench and Drawers complete, as approved by the Gas Referees.

LOWE'S JET PHOTOMETER.



"LETHEBY"

Photometers,

with Fittings and Bench complete for Dark Room, as approved by the Gas Referees.

LOWE'S JET PHOTOMETER

(KIRKHAM AND SUGG'S IMPROVEMENTS),

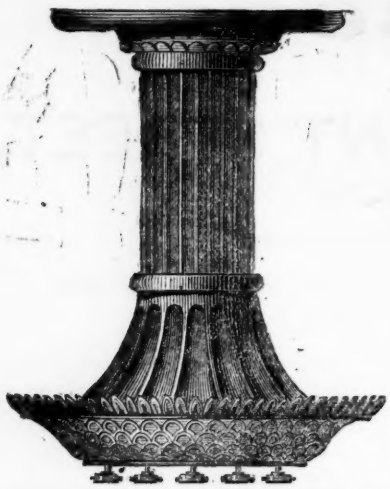
With new external Water-Line Regulator; Improved Micrometer, with Quadrant divided into 45 degrees; Valve, with *pro ratâ* opening; Improved Ventilator, Purple Glass Height of Flame Measurer; King's Gauge, working on Friction Rollers. In French Polished Pine Case. Diagram for ditto for finding the Illuminating Power in Candles.

PRICE £12 10s. COMPLETE.

Can also be had with additional Scale on Pressure Gauge, to show by inspection the Illuminating Power in Sperm Candles, at a slight extra cost.

NOTE.—When an order is given for a Jet Photometer with this latter addition, it will be necessary to state about the quality of Gas for which it will be used. The range in candles will not be more than three or four.

PRICE LISTS WILL BE FORWARDED POST FREE ON APPLICATION.



HENRY GREENE & SON,

GAS AND HOT WATER ENGINEERS,

155, CANNON STREET, E.C.

Manufactory: 19 & 20, NICHOLAS LANE, E.C.

SUN-BURNERS,

With Regulating Valves to obviate down draught.

MEDIÆVAL & OTHER GAS-FITTINGS

For Churches and Domestic Use.

ARCHITECTS' OWN DESIGNS WORKED OUT.

ESTIMATES FREE OF CHARGE.

THE TRADE SUPPLIED.

SOLE CONSIGNEES FOR BRÖNNER'S IMPROVEMENTS IN GAS LIGHTING.

IN THE MATTER OF

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GAS-BURNERS.

HENRY GREENE AND SON, 155, Cannon Street, London, Sole Agents for Great Britain, Ireland, and Colonies, of Brönner's Improvements in Gas Lighting, beg to inform the public that on the 13th of January, 1876, Julius Brönner obtained an injunction in the Court of Session, Scotland, against Donald M'Vean, Gas-Fitter, 14, Newton Street, Glasgow, prohibiting him from in any way advertising or offering for sale as Brönner's Burners, any Burner not manufactured by Julius Brönner, or from in any way inducing the public to believe that the said Donald M'Vean sells or keeps for sale Brönner's Burners, manufactured by Julius Brönner, while such is not the case.

Also that on the 9th of November, 1875, he obtained injunction in the same Court, and in the same terms, against R. M. Brechin and Co., 46, North Hanover Street, Edinburgh.

Also that on the 20th of April, 1875, in a suit in Chancery, before Vice-Chancellor Malins, number 1874, B 365, he obtained injunction against another defendant, in the same terms and on similar grounds.

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PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

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Manufacturers of

CAST-IRON GAS AND WATER PIPES.

SIZES: ¾ to 12 inches at GLASGOW.

„ 1½ to 7 „ STOCKTON.

A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 12s. 6d. from Glasgow.

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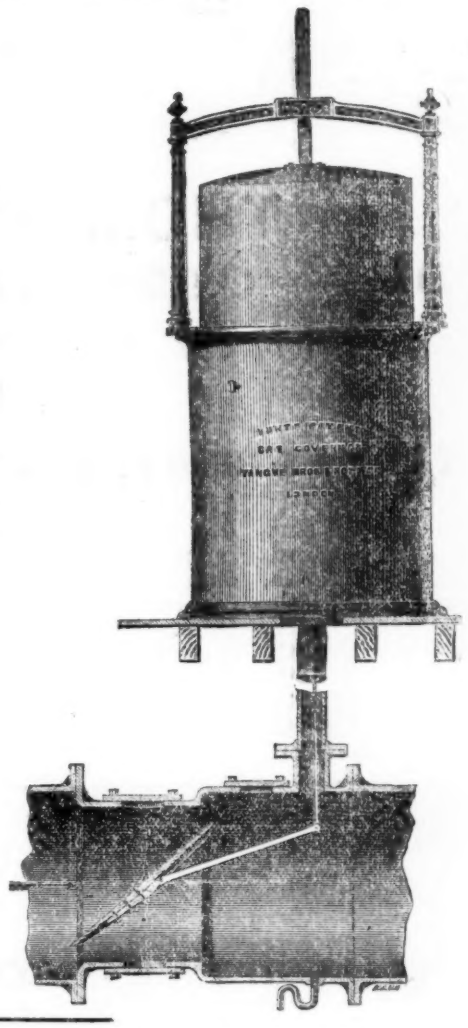
LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Co.—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Co.—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "

The Exeter Gas-Works—a 24 in.
" Abergavenny Gas-Works—a 10 in.
" Birmingham Gaslight Co.—an 8 in.
" Monmouth Gas-Works—an 8 in.
" Devonport Gas-Works—an 8 in.
" Cannes Gas-Works—an 8 in.
" Mentone Gas-Works—an 8 in.
" Rochdale Gas-Works—a 4 in.
" Imperial Gas Co., a 12 in at Great Cambridge Street.

TESTIMONIAL.

The Gaslight and Coke Company, 9, Water Street, New Bridge Street, Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, Engineers, London, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

Upwards of 12,000 have been sold in England and America.

In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

The following are a few of the leading Sizes in use in Gas-Works and Chemical Works:—

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3	1½	9	450	£16
4*	2	9	815	18
3	3	9	1,830	18
5*	3	12	1,830	22 10
4	4	12	3,250	25
6*	4	12	3,250	30
5	5	12	5,070	32 10
7*	5	12	5,070	40
6	6	12	7,330	40
8*	6	12	7,330	50
7	7	12	9,750	50
10*	7	12	9,750	65

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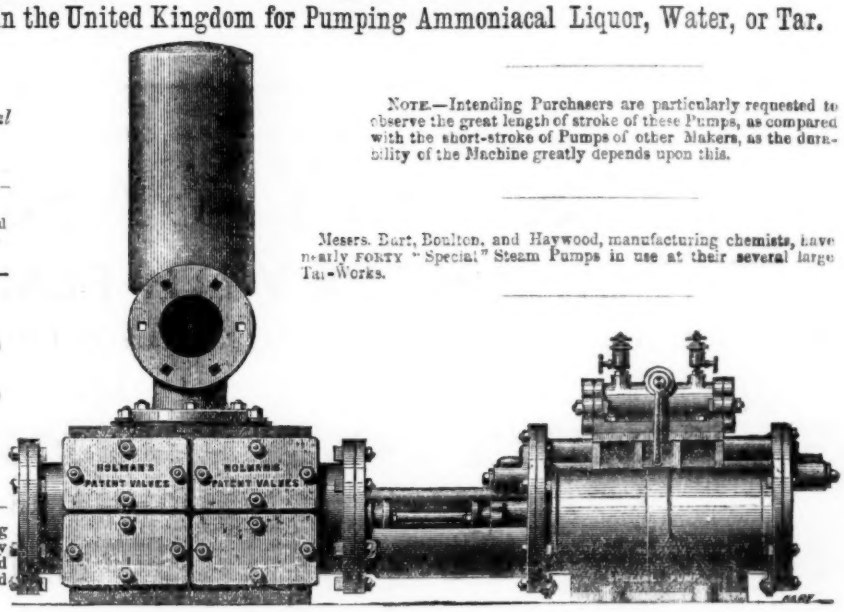

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 15, 1876.

Circular to Gas Companies.

THE anxiety of the South London vestries to keep the South Metropolitan Gas Company isolated was shown the other day, by the fact that Alderman McArthur, the member for Lambeth, was put up to ask the President of the Board of Trade whether, in the event of a scheme of amalgamation being submitted to the Board, he would make provision for the retention of the standard price of 3s. 6d. in the company's district? Sir Charles Adderley's answer was the only one that could be given, and was to the effect that until a scheme was submitted it was impossible to say what provisions the Board might think necessary to insert. The desire of the vestries, if it exhibits selfishness, may be considered natural and excusable. It is an old story, of which, if we were at liberty to discuss general politics, we might adduce many illustrations. A low-rated parish, or a low-taxed class, always exhibit an invincible repugnance to the equalization of taxation. If the vestries of Camberwell and Lambeth had had anything to do in bringing about the favourable conditions as regards gas supply they now enjoy, something might be urged in their favour; but nothing of the sort can be alleged. They are the fortunate victims of circumstances which they have had no hand in creating, and they selfishly desire to keep all the advantages to themselves. They will obtain small consideration whenever a metropolitan authority get hold of the gas undertakings, although they may for a time enjoy an exceptional privilege.

The Acts of the Chartered and South Metropolitan Companies received the Royal Assent on the 11th inst., and, although our readers must be pretty well acquainted with their provisions, we may now give a brief recapitulation. By the first Act now referred to, the stock and share capital of the Chartered Company is fixed at £8,265,000, that is, one million in addition to the united capitals of the Chartered, Imperial, and Independent Companies. Besides this, the company obtain power—or rather, we must now say, are compelled by this Act, to raise an additional million by borrowing. Thus the borrowed capital of the company will eventually amount to £2,561,500, and the total loan and share capital will be £10,826,500. These figures will become of much importance when, some years hence, the question of purchase comes to be considered.

We shall say but little about the conditions under which the new capital may be raised, *i.e.*, the proof, before a justice, that the full proportion of loan capital has been borrowed before further share capital can be issued. This we are inclined to resent as an indignity. No other joint-stock company have similar restrictions imposed on them, and we do not see why metropolitan gas companies should be singled out for such invidious conditions.

In one respect the Act promises well, inasmuch as—though it fixes, or rather sets down, the future capital of the company at a definite sum—it allows of some elasticity. When at some date, which we shall not attempt to guess, the million of share and the million of loan capital have been raised, the company may, with the consent of the Board of Trade, raise any further sums (of course, in like proportion) sufficient for three years expenditure. Thus any further application to Parliament for power to raise additional capital is rendered unnecessary; but we are not certain that much will be gained; for if the Metropolitan Board object, an inquiry must be held before a sort of commissioner appointed by the Board of Trade; and we know, from past experience, that such an inquiry may be as expensive as proceedings before a parliamentary committee. The changes to-day are too rapid to allow of our speculating as to the date when the provision may be brought into effect; but we, nevertheless, regard it with satisfaction, inasmuch as it, at all events, promises to save expense.

The new share and stock capital, which these Acts authorize, will be entitled to a dividend of ten per cent., which is described as the "standard" dividend. Our readers know all about the "standard" price of 3s. 9d. and the sliding scale, and we need not now allude to them. But a "standard" dividend is a thing of some importance. Under some circumstances, and when the price charged for gas is below the "standard," the companies will have power to form reserve-funds applicable to make up a deficiency of dividends. Such a provision, it will be remembered, was inserted in the Regulations Bill; but it will be recollected that Mr. Forster decided that the reserve-fund, authorized by that Bill, could only be applied to make up a deficiency in the dividend according to the rate determined by the sliding scale. These Acts are probably framed with the design of carrying out the object above mentioned, but we rather think the phraseology is such as will leave the intention of the legislature somewhat obscure. By a "standard" we usually understand something fixed and immutable, but in these Acts the word "standard" has a singularly elastic meaning, what is called "the standard dividend" is in one section ten per cent., in another section it appears to be any thing the sliding scale may make it. The reserve-fund, which can only be formed out of an excess of profits when the price of gas is below the "standard," it is enacted, may be employed to make up the dividend to the "standard" rate, whatever it may be. The duty and policy of the directors is thus made perfectly clear. Their first duty, if they can sell gas for less than 3s. 9d. (we here allude to the Chartered Company only), will be to amass the largest reserve-fund they can, and so practically guarantee, as far as possible, full dividends.

The provisions of the Act of the South Metropolitan Company, as regards the raising of new share and loan capital, standard dividend, sliding scale, and auction clauses, are identical with those in the Chartered Company's Act. The single and sole difference is in the standard price, which must, of course, exert an important influence on the dividend of the South Metropolitan Company.

It is still too early to speculate on the ultimate effect of the auction clauses, which deprive shareholders of any advantage that might accrue from further allotments of shares at par. We note to-day, not without astonishment, that, according to

a broker's list before us, the Chartered Company's A stock is quoted at 206-209, while consols are at 96¾. There must be hopeful people in the world. By and by, and before any shares are put up for auction or tender, we shall go fully into a consideration of future prospects. To-day we need not look forward, for the date of sale is yet distant.

There is but one other point in the Chartered Company's Act to which we shall here allude, and that only concerns the fortunes of a few young gentlemen who are now engaged as gas examiners. The 34th section of the Act provides in effect that there need be but two testing stations within the company's limits, one being situated in the City of London and the other outside. Now, we may presume that before very long the entire network of mains belonging to the company will be connected, and thus the gas from all the stations will become more or less mixed. The Metropolitan Board may then consider that one testing place will be sufficient for all practical purposes, and that they might as well save the salaries of six examiners. There will, however, be some difficulty in effecting this economy, unless a complete understanding be arrived at between the Company and the Board. In case of an excess of sulphur there is no difficulty, for the penalty is a lump sum. Further than that, we gather from recent discussions that the Board do not regard "sulphur" in gas as an offence. But in case of defect in illuminating power, the penalty is to be calculated on the quantity of gas delivered from a station in default. Prominent members of the Board are constantly asserting, however, that they regard the present system of gas testing as a farce; and therefore we shall not be surprised if they seek to make the section of the Act to which we have alluded an excuse for the economy we have mentioned, and this means a saving of £600 a year—more than they are ever likely to recover from the company in the way of penalties. They may be content to have the gas tested in their own laboratory in Spring Gardens, and we know that the Gas Committee of the City of London are incessantly protesting against having the gas consumed within the City, tested miles away from the limits of consumption.

A curious difficulty has arisen respecting the audit of the Commercial Company's accounts. By the 59th section of the company's Act of last year, it is enacted that, before the half-yearly accounts are certified by the official auditor, they shall be submitted to the Metropolitan Board of Works, who, if they see reason, may raise objections. Now, on Friday last, the Board adjourned for their usual vacation of six weeks, and the company's accounts had not been presented, and it was said would not be ready for ten days. To have to wait six weeks for the decision of the Board would be a serious inconvenience to the company. In this dilemma the solicitor to the Board has recommended that the accountant of the Board should examine and pass the accounts, and the recommendation has been adopted, not, however, without remonstrance. With all deference to the solicitor's opinion, we may say, that the decision of the accountant is not the decision of the Board. The provision which causes this difficulty was inserted at the instigation of the Metropolitan Board; and it might have been foreseen at the time that a hitch of this kind might occur every summer. We notice that no provision of a like character is to be found in the Acts of the Chartered and South Metropolitan Companies—further evidence of the want of uniformity in metropolitan gas legislation.

We have already mentioned that the gas undertaking of the Corporation of Wigan is a losing concern. We do not care to repeat how much has been lost since the undertaking came into the hands of the Corporation, but it is perfectly clear that the time had come for some alteration to be made. The quantity of "unaccounted-for" gas, we have said before, has been 35 per cent. of the make, and the Corporation have very wisely resolved to spend £10,000 in laying new mains, by which this enormous loss may perhaps be reduced to the reasonable proportion of 10 per cent. This is the right course to pursue, but, along with this, some petty savings have been proposed, which savour more of meanness than economy. Thus it has been suggested to the Corporation to reduce the salary of an old servant of the extinct company from £130 to £80 per annum. We are glad to see that many, if not a majority, in the Town Council, are opposed to this mode of saving money. We know nothing of the circumstances of the case further than we can gather from newspaper reports, but we may say at once, candidly, that we hardly approve of the mode of making small savings proposed at Wigan.

The Burghs (Scotland) Gas Supply Act has also received the Royal Assent. We have before expressed an opinion that the Act is not likely to operate prejudicially to the interest of gas companies, and we doubt whether its provisions will be generally adopted. But, for their own protection, we must advise the unincorporated companies to apply for Provisional Orders, which, when confirmed, will insure them against possible confiscation.

It is difficult to see the force of some of the arguments used by the advocates of the corporate purchase of gas undertakings. Forty or fifty years ago a company may have been started to supply gas in some town—say Warrington. They persevere with varying fortunes for several years, but at last the undertaking is established on a firm basis, is perfected, we may say, and is, moreover, profitable. Then it is suddenly discovered that the "supply of gas "enters too intimately and too generally into the common wants "and common prosperity to be safely left in the hands of a com-"pany," not even the company who have created and perfected the business. It might as well be argued that a locomotive could not be safely left to the management of the men who have constructed the machine. It is equivalent to saying that the supply of meat and groceries cannot be safely left to the tradesmen who have hitherto never failed to satisfy the wants of a community. Let them try to disguise it as they will, the desire to obtain large profits is the real stimulus. There is a vague opinion abroad that when a local authority possess a gas undertaking they save rates. The people of Warrington may go to Wigan, not a long distance off, and ascertain how far this hope is sometimes fulfilled.

The Corporation of Warrington have settled the purchase of their gas undertaking, and the ratepayers are already beginning to ask, *cui bono?* How are the Council to make a profit? They have to pay over to the shareholders what we may call the normal profits of the undertaking, and where is anything else to come from? Well, the Town Council will have to look mainly to a natural extension of trade for extra profits; and if they take our advice, they will do their utmost to keep down the price of gas, and so promote consumption. In that way they will do more for the benefit of ratepayers and consumers than by keeping up the price and applying surplus profits in aid of an improvement or the general district rate.

The dispute between the Town Council of Deal and the gas company remains unsettled; but a settlement can hardly be far off, if it be not already arrived at. The fact that some arrangement might be effected just about the time we go to press prevents us saying more on the matter to-day.

Water and Sanitary Notes.

The Rivers Pollution Bill has been passed by the House of Lords, and will in due course receive the Royal Assent to-day or to-morrow. When we have the Act before us, we shall point out the probable effects of its principal provisions. The Act, we notice, causes much dissatisfaction to those who would witness, without regret, the extinction, for an idea, of some of our most important manufacturing industries. They call it a "manufac-"turers Act," and say it ought rightly to be named a "Rivers "Pollution Facilities Act." We are, of course, glad that the measure has been modified by manufacturers, whose interests are national. It may appear to a cockney newspaper writer a small matter to shut up a manufacturing establishment employing some hundreds of hands; but we may tell him that, if such an Act as he desires should pass, it would result in the closing of hundreds of such establishments, with effects that would be disastrous to the whole country. It is not too much to say that the manufacturing pre-eminence of Great Britain is now trembling in the balance. What with combinations of workmen, and the agitation of sanitarians, the life of a manufacturer is becoming unbearable, while his profits are being reduced to the vanishing point. It may not be known to the gentlemen who write so strongly on this subject, that an increase or reduction in the cost of production of a small fraction of a farthing means profit or loss, success or ruin. But the fact is well known to the manufacturers, who have, we are happy to say, succeeded in getting the Rivers Pollution Act into its present shape. We can afford to wait. We are not all poisoned yet, and salmon has been sufficiently plentiful this season to have become a nuisance to every diner out. When a revival of trade, and a return to prosperity, come, it will be time to think of putting our manufacturers to great expenses in order to purify rivers which are only impure to sentimentalists.

The Clean Rivers Bill was, as we conjectured it would be, withdrawn; but there was merit at the bottom of it. It is much more easy to preserve a clean river clean by Act of Parliament than to prevent the fouling of one which has been polluted by long prescriptive right We have always advocated the concentration, as far as possible, of trades liable to produce a nuisance, in order to circumscribe the area of pollution; still we must confess that it would be a hardship to prevent a paper manufacturer from establishing a mill on a clean stream which would furnish power to drive his machinery, and give him the quality of water he desired.

The Metropolitan Board, at their last meeting, were occupied in a short discussion of the question of what were to be considered noxious or offensive trades under the 3rd section of 37 & 38

Vict., cap. 67. They decided that the business of a manufacturer of mineral acids, and also of ammonia and its salts from gas liquor, should be deemed offensive trades; and, truth to say, we have but little to urge against their decision. The escape of noxious vapours from mineral acid works is so completely under the control of the manufacturers, and the prevention of escape is attended with so much economy, that almost complete condensation may very properly be insisted on. The manufacture of ammoniacal salts from gas liquor cannot, however, be carried on entirely without offence. The liquor arrives at the works in vessels, which must be opened under conditions allowing of the escape of some sulphuretted hydrogen into the atmosphere. That is unavoidable. But, as regards the sulphuretted hydrogen evolved when the liquor is saturated with an acid, that we feel bound to say may all be condensed with profit to the manufacturers. Sulphur ought not to be wasted, except in the firing of gunpowder.

Another sewage company have come to grief. The Nuneaton works of the General Sewage and Manure Company (Anderson's Patent) have been sequestrated by Lord Ellibank, the mortgagee; and it seemed at one moment that the town would be flooded with sewage, in consequence of the cessation of pumping operations. The danger is obviated for the present, but we do not see what the result will be. Sewage manure schemes seem destined to fail.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CIV.

Quantitative Analyses of Gas. Bunsen and Roscoe's Method.

In the past chapters we have described methods of making chemical qualitative analyses of coal gas; we now propose to give a brief account of the most recent methods devised for making a quantitative determination of its constituents.

The method of quantitative gas analyses, introduced some years back by Messrs. Bunsen and Roscoe, possesses the great merit of combining comparative simplicity of manipulation with accuracy in the eventual results. At the same time, the accurate practice of the method requires, in common with other processes of quantitative gas analysis, a certain degree of skill in the use of tube apparatus, and care in the performance of all the manipulative details of the experiments.

The most characteristic feature of this method of gas analysis is the use of balls of various absorbent materials, which are successively introduced into the gas under experiment, and each of which removes one or more of the different compounds present, without in any way affecting the other constituents. By this means the diminution in volume which a measured quantity of gas suffers under the action of each appropriate absorbent indicates the proportion in which each corresponding constituent is present. Unfortunately, this process of absorbtion can only be applied to a comparatively limited number of gaseous substances, so that, after the experiment has reached a certain limit, the composition of the residual gas can only be determined by explosion in the eudiometer and subsequent calculation of the results. The following sketch shows the arrangement of apparatus in Bunsen and Roscoe's method.

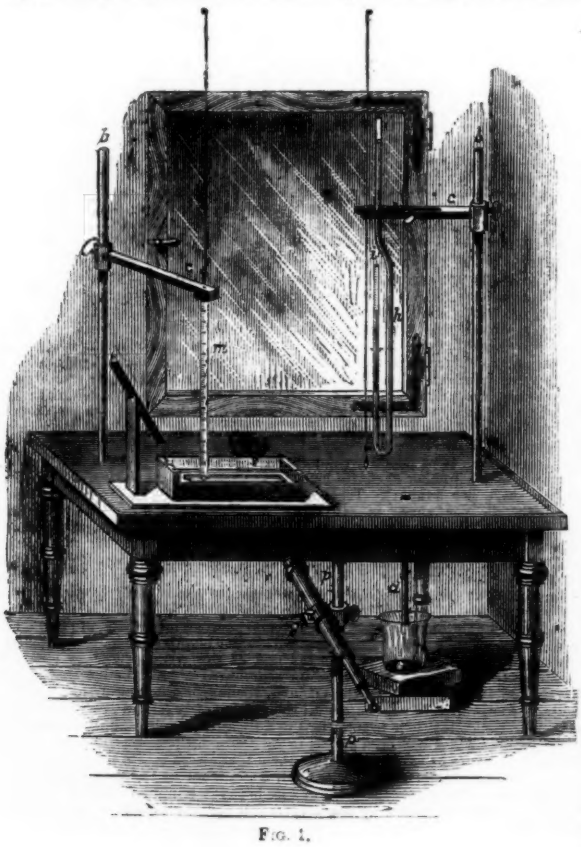


Fig. 1.

The apparatus must be arranged in a room which always possesses an equable, and, as far as is possible, normal temperature, and which has likewise a good light. For this purpose a room is selected with a northern aspect, and possessing one or two good sized windows. The walls should likewise be thick, and the room itself protected from any abnormal external heat.

Referring to the diagram, the table upon which the gas apparatus is arranged should be perfectly level, and provided with a marginal rim. A tube, *a*, serves to carry off any mercury which may be spilt in any of the operations, and which collects in the beaker glass, *f*, placed beneath. Two upright supports, provided with suitable clamps, are fixed firmly at each side of the table. One of these supports serves to hold the syphon barometer, *h*, while the other supports the eudiometer, *m*, the lower end of which dips into the mercury trough beneath. A small telescope or cathetometer, as it is termed, *q*, is used for reading the tube graduations, and observing the mercury levels, and serves the double purpose of obtaining more accurate readings than would be possible to the unaided vision, and, at the same time, permitting observations to be conducted without running the risk of elevating the temperature of the gas by a too near approach of the observer's body. The instruments used in the measurement are termed eudiometer-tubes and absorption-tubes, typical forms of which are respectively represented at fig. 2. The absorption-tubes are used for the ordinary processes of the experiment, in which a certain volume of gas is submitted to the action of absorbing reagents, while the eudiometer is used when it becomes necessary to resort to explosion for the purpose of ascertaining the composition of the residual gas, which is left after the action of the various absorbents is complete. The explosion is effected by the electric spark, which is passed through the gas by means of two platinum wires, which are fused into the top of the eudiometer, and the points of which approach closely, but do not touch, within the tube. The mercury trough has two of its opposite sides constructed of plate glass, the trough itself being made of dense pear wood, which, prior to use, is rubbed over with a solution of mercuric chloride, and subsequently with mercury itself, in order to ensure the

Fig. 2.

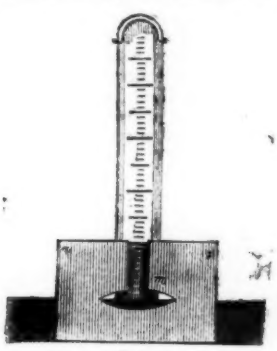


Fig. 3.

thorough adhesion of the metal, and thus prevent any error which might arise from the retention of air bubbles and their possible introduction into the volume of gas which is being examined. The greatest care must be taken to keep all the tubes used, as well as the mercury in the trough, perfectly clean and bright.

In exploding a volume of gas in the eudiometer, the open end of the tube is firmly pressed on to a flat piece of cork, attached to the bottom of the mercurial trough, and covered with a piece of thick vulcanized caoutchouc, fig. 3. The surface of the caoutchouc is moistened with mercuric chloride solution, to ensure adherence of the mercury and prevent the retention of air-bubbles, which might eventually occasion error by entering the eudiometer. The graduations of the eudiometer and absorption tubes are rendered more visible prior to use by rubbing in a little red lead, and to still further facilitate the readings, a small paper screen, *a a*, fig. 1, is placed between the mercury in the tube and the glass side of the trough, the graduated scale and mercury levels being observed through a slit in the screen, at M. For convenience in transferring quantities of gas to the graduated tubes for purposes of experiment, the apparatus, fig. 4, is useful.

It is provided with an inlet, *b*, in which is fixed the tube, *e*, and also with a delivery tube of small diameter, *c*: at *d* is a sort of valve, answering the purpose of a tap, the construction of which is seen at fig. 5, where the ends of the two tubes, *c* and *b*, are connected together by a short piece of rubber tubing in such a way as to leave a small interval, in which is placed a piece of solid glass rod, *e*. It will be seen that when the arrangement is in the position represented in the diagram, there is a free passage for gas, but when it is desired to cut off all connexion, this is effected with ease and certainty by

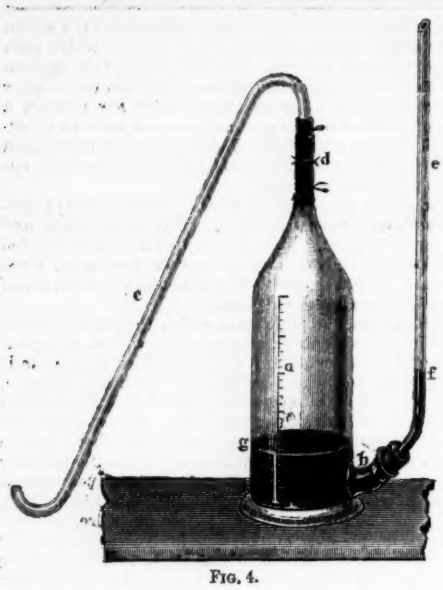


FIG. 4.

FIG. 5.

simply tying the centre of the rubber connection with a piece of thin string. In using the gasometer, fig. 4, the valve, *d*, is first closed, and the apparatus inverted; the tube, *e*, with its cork, is then removed, and the vessel filled with mercury. The tubulure, *b*, being then closed by the thumb, and the apparatus again placed in an upright position, the tubulure may then be unsealed without the fear of air entering, and the gas allowed to enter through the tubulure to the extent required, the mercury escaping as the gas enters. The tube, *e*, being replaced, and mercury poured down the tube until the level is slightly higher than the main bulk in the gas vessel, the gasometer is ready for use, and its contained gas may be expelled to any degree required by opening the valve, *d*, and pouring more mercury down the tube, *c*.

The absorption part of gas analysis is conducted, as has already been remarked, by means of balls of various appropriate reagents; these balls are, for the sake of convenience, attached to pieces of platinum wire of the requisite length, and by this means they may be introduced into the absorption-tube through the mercury, and allowed to remain in contact with the gas as long as is considered necessary to produce the desired result. Two descriptions of balls are used—viz., those which are composed of some solid reagent, which is brought, by means of fusion or moulding, to the desired shape, and those constructed of some absorbent material, such as coke or *papier maché*, which are subsequently imbued with the necessary reagent, and dried or used moist, as required. As the present paper refers only to the application of Bunsen and Roscoe's method to the analysis of *coal*-gas, the description will be confined to the method of making those balls only which are used for this special purpose. For the construction of balls of any fusible material, such as caustic potash, used for the absorption of carbonic acid, sulphuretted hydrogen, or aqueous vapour, the potash is fused and poured in a melted condition into a common iron bullet-mould. The mould is best prepared by filing off the canal by which the metal is usually introduced, by which proceeding less trouble is subsequently required in trimming the balls after casting. A small notch filed on the surface of one of the under sides of the mould enables a platinum wire to be introduced from underneath, and thus be altogether out of the way during the process of casting. The pieces of platinum wire used may be about a foot long, and the extremity which is within the mould is slightly coiled up; the ball may then be cast, and the whole allowed to cool. The mould is then slightly warmed, opened, and the ball of fused material withdrawn, and the surface trimmed as smooth as possible, as there is then less chance of its retaining air bubbles when subsequently used.

Balls of phosphoric acid are of use in removing aqueous vapour, and these are easily made by dipping the coiled end of a platinum wire into cooling fused phosphoric acid, and redipping until the requisite quantity of material is retained by the wire. Sulphuretted hydrogen is most conveniently removed by means of balls composed of manganese dioxide, and for making these the interior of the mould is well oiled, a piece of platinum wire arranged as before, and the finely-divided dioxide, made into a thin paste with distilled water, is then introduced. The whole is subsequently dried on a hot sand-bath, and the ball of material may then be obtained in a compact form. Prior to use, it is moistened with syrupy phosphoric acid, in order to prevent the removal of any other gas than sulphuretted hydrogen, which, owing to the porous nature of the manganese dioxide, it is apt to do. For the removal of olefiant gas (elayl) and its homologues, strong sulphuric acid saturated with sulphuric anhydride is used, a ball of coke being imbued with the compound, and introduced into the gas. The balls for this purpose are made by mixing together one part of bituminous coal, as free as possible from iron pyrites, and two parts of coke, both being in fine powder. The mixed powder in a dry condition is placed in the bullet-mould, a piece of platinum wire having been previously inserted, and the whole heated slowly over a charcoal fire until red hot. If the ball thus produced is found to be too porous, it is rendered denser by heating, dipping into sugar syrup or coal-tar, and being afterward exposed to strong heat before the blow-pipe. The balls should be boiled in nitric and hydrochloric acids before being used, to remove metals and metallic sulphides. *Papier maché* balls are also useful for some purposes, more especially for the absorption of carbonic oxide, for which purpose they are imbued with a strong solution of cuprous chloride. The balls themselves are made by pressing wet filter paper into the bullet-mould, and afterwards drying at 100°C. Finally, in the use of the various absorbents, great care should be exercised in introducing the balls into the gas not to allow any air to enter. The balls should, by neat surface-trimming after being cast or moulded, present as smooth, non-adherent a surface as possible, and before being brought up into the absorption tube, should be lightly rubbed with the finger, under the level of the mercury in the trough. When withdrawing a ball from the gas, it should be at first drawn somewhat rapidly beneath the level of the mercury, and there allowed to remain while the reading is being made. With these precautions there will be but little fear either of introducing air, or of withdrawing gas. In addition, it may be stated that success can only be attained in this method of gas analysis when beyond the conditions previously mentioned, two other particulars are likewise attended to—viz., that a sufficient time must always be allowed for the full absorption to take place with each special reagent, and that, after each manipulatition, the gas must be allowed to acquire the temperature of the operating room before a reading is made. The next chapter will be devoted to the actual analysis of coal gas, with the apparatus and by the use of the reagents previously described.

(*To be continued.*)

Correspondence.

RIGHT *VERSUS* WRONG.

SIR,—Mr. Macrae, Bury St. Edmunds, should have seen and considered the correspondence I commented on before he bestowed his pity on me in his letter of the 4th. As he seems to think the expressions "confederate rogue," "illegal compact," "nefarious system," &c., look rather like a justification of the unjust manager, I will gladly endorse any stronger condemnatory expressions he can suggest, provided always that they are not objectionable on other grounds.

Edinburgh, Aug. 10, 1876. J. K. WATSON.

PETROLEUM FOR STREET-LAMPS.

SIR,—Referring to your paragraph, July 4, 1876, p. 19, "Petroleum for Street-Lamps," I shall be much obliged if your correspondent can furnish me with a copy of the "flattering testimonial from the Corporation of Poole," and say by whom it is signed. As one of the corporation, I know nothing of the testimonial; and am told at a meeting of the corporation no such testimonial has been given.

Being also a gas director, I am anxious to get at the truth.

Poole, Dorset, Aug. 12, 1876. H. FARMER.

DEATH OF MR. JAMES RITCHIE.—The death of this gentleman, in his 76th year, is just announced. He was for many years manager of the Glasgow Gas Company's works at Townhead, Partick, and Tradeston, and continued to hold that important post until the transfer of the undertaking to the Town Council.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—The usual quarterly meeting of this Association was held on Thursday, the 10th instant, at the "Bedford Hotel," Southampton-row, London. The Association now numbers about thirty members. A paper was brought before the meeting, which had been prepared by Mr. Farrand, of Croydon; but, he being unavoidably absent, it was read by Mr. C. E. Botley, of the West London Junction Gas Works. The paper treated on the "Make and Sale of Coke;" as to the quantity obtained from the different descriptions of coals, of the advisability of storing coke or selling it at a low figure (the latter system the writer being greatly in favour of), and as to whether some regular measure could not be adopted for the sale of coke, instead of so many methods as there are now in use. The paper provoked a most healthy discussion, which lasted during the whole sitting; and with a vote of thanks to the writer of the paper, Mr. Farrand, of Croydon, and the same to the president, Mr. Wood, of Hastings, the meeting concluded.

PROPOSED PURCHASE OF THE WARRINGTON GAS-WORKS.—The *Warrington Examiner*, of the 29th ult., says:—"Yesterday the half-yearly meeting of the Warrington Gaslight and Coke Company was held at the offices of the company, in Mersey Street, "for the purpose of taking into consideration an offer made by the Town Council of the Borough of Warrington, to purchase the company's gas-works, property, assets, and undertakings, upon certain terms and conditions, which were then laid before the shareholders for their approval or otherwise." The meeting was private, but we are informed the shareholders decided to accept the terms offered by the corporation, on the understanding that the corporation accepted the liabilities of the company. The terms upon which the purchase is made are as follows:—To the shareholders who hold 1800 £20 shares paid up, a perpetual annuity of £3600 per annum, less income-tax, payable half-yearly, according to the number of shares held by the shareholders respectively (being £2 per share per annum). To the shareholders who hold 3600 £20 shares on which £8 per share is called up, a perpetual annuity of £2520 per annum, less income-tax, payable half-yearly (being 14s. per share per annum). The corporation to take over and be responsible for the bonded debt of £5,350 and interest from the date of transfer; the bonus of 10s. per share on each class of share, being a sum equal to £2,700 to be paid in cash in addition to the above, according to the number of shares held by each shareholder respectively. Any shareholder may exercise the option of having annuity bonds redeemable in one year at 24 years purchase, in lieu of perpetual annuities, such option to be declared within one month after date of purchase. The corporation are also to pay for the cost of the transfer, and to assist in obtaining the necessary powers for its completion." At the meeting of the Warrington Town Council, on the 1st inst., the mayor announced that the sub-committee appointed to negotiate with the gas company for the purchase of their works had conducted their negotiations to a successful issue, and that terms had been arranged which had been agreed to by the company, and the members of the Council would be asked to sanction them that evening. He thought it would prove to be one of the most important purchases made by the corporation since the borough had been incorporated, and he hoped it would be only the first of a series of works undertaken by the corporation for the benefit of the borough generally.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, Aug. 7.

Pollution of Rivers Bill.—This bill, brought from the Commons, was read the first time.

Tuesday, Aug. 8.

The Commons amendment to the Lords amendments to the Stockton and Middlesbrough Corporations Water Bill was considered and agreed to.

POLLUTION OF RIVERS BILL.

The Marquis of Salisbury, in moving the second reading of this bill, said it was very much the same measure which had passed the House of Lords last year, and was lost in the House of Commons in the usual confusion of business in that house at the end of the session. It did not go quite so far as that measure, and it proposed to effect three objects—the exclusion of solid matter and sewage from rivers, as well as all new sources of pollution arising from manufactures and mines.

The bill was read a second time and committed.

Thursday, Aug. 10.

Pollution of Rivers Bill.—The House went into committee on this bill, and the clauses were agreed to, with amendments.

Friday, Aug. 11.

The following bills received the Royal Assent:—Burghs (Scotland) Gas Supply, Cleveland Water, Wakefield Water, The Gaslight and Coke Company, South Metropolitan Gaslight and Coke, Stockton and Middlesbrough Corporations Water, Halifax Water and Gas Extension.

The report of the committee appointed by the Local Government Board to inquire into the several modes of treating town sewage was presented.

The Commons amendments to the Llandudno Improvement Bill were considered and agreed to.

Pollution of Rivers Bill.—The report of the amendments made in this bill was considered and agreed to.

Saturday, Aug. 12.

Pollution of Rivers Bill.—This bill was read the third time, with the amendments, and passed.

HOUSE OF COMMONS.

Monday, Aug. 7.

The Lords amendments to The Gaslight and Coke Company and the South Metropolitan Gaslight and Coke Bills were agreed to.

The Lords amendments to the Stockton and Middlesbrough Corporations Water Bill were agreed to, with an amendment.

The Llandudno Improvement Bill (Lords), as amended, was considered; clause added; amendment made. Bill to be read the third time.

Tuesday, Aug. 8.

The Lords amendments to the Halifax Water and Gas Extension Bill were agreed to.

Thursday, Aug. 10.

The Llandudno Improvement Bill (Lords) was read the third time and passed.

Clean Rivers Bill (Lords).—The order for the second reading of this bill was read and discharged, and the bill withdrawn.

AMALGAMATION OF THE SOUTH METROPOLITAN GAS COMPANY.

Alderman M'Arthur asked the President of the Board of Trade whether, in the event of any scheme being submitted to the Board of Trade for the amalgamation of the South Metropolitan Gaslight and Coke Company with any other gas company, the Board of Trade will make provision in such scheme that the maximum and standard price of 3s. 6d., limited by the Acts relating to the South Metropolitan Gaslight and Coke Company for gas supplied within the district of that company, shall continue to be the standard price for gas within that district.

Sir C. Adderley: Until such a scheme as is supposed in the question is submitted, it will be impossible for me beforehand to state what provisions it will be necessary for the Board of Trade to insert in it. A scheme of amalgamation would have to receive the sanction of an Order in Council.

Friday, Aug. 11.

A statement was presented of accounts of the Metropolitan Water Companies for the year 1875, which have been prepared in pursuance of "The Metropolis Water Act, 1871."

HOUSE OF COMMONS COMMITTEE.

Monday, May 15.

(*Before Sir* Wilfrid Lawson, *Chairman; Mr.* T. Hildyard, *Major* Dickson, *and Mr.* Taylor—*Sir* John Duckworth, *Bart., as Referee.*)

SOUTHPORT IMPROVEMENT BILL.

Sir E. Beckett, Q.C., Mr. Pope, Q.C., and Mr. Salisbury appeared for the promoters; Mr. Chandos Leigh, for the lessees and occupiers of property in Birkdale; Mr. Littler, Q.C., and Mr. Ledgard, for the Lancashire and Yorkshire Railway Company; Mr. Littler, Q.C., and Mr. Michael, for the Birkdale Local Board; and Mr. Aspinall, Q.C., on the petition of owners, lessees, occupiers, and ratepayers in opposition to the bill.

This bill embraced a considerable number of objects—the extension of the boundary of the borough, the construction of new streets, the erection of new gas-works, &c. For the purpose of the gas-works, it proposed to authorize the corporation to lay out £230,000, and to purchase 6 acres 14 perches of land adjoining their existing works. Our report of the proceedings before the committee relates only to the speeches and evidence on the gas undertaking of the corporation.

Sir E. Beckett, in the course of his opening speech for the promoters, said that most of the objects sought for by the corporation were unopposed, and substantially the main opposition was the opposition of the Birkdale Local Board to the extension of the borough, and the consequent dissolution of their body. It was a matter of a kind which had been several times under the consideration of Parliament, and with varying results. There had been one case during the present session, but the attempt failed. In that case there was a strong opposition to the proposed inclusion of Hove in the borough of Brighton from nearly everybody in Hove—landowners, ratepayers, and commissioners. He was happy to say that in this case there was no opposition from twelve of the chief landowners in Birkdale. Southport contained a population of 28,000, and Birkdale of 5000 people. The proposal was to include Birkdale in Southport for the purposes of government, sewage, drainage, &c., and also to make some alteration in their arrangements about gas. The town of Southport, from the year 1846 to the year 1865, was under the control of a body of commissioners. In 1865 an Improvement Act was passed and the then incorporated commissioners were empowered to borrow £60,000 for gas and markets, &c. In 1871 another Improvement Act was passed. In 1865, when the former Act was obtained, the township of Birkdale was not included, but in 1871 Birkdale was included within the gas limits, with this provision, which had turned out to be very inconvenient, that the gas mains which had existed before remained the property of the local board. The Corporation of Southport had been the makers and suppliers of the gas, but they supplied it in bulk to the local board. It did not seem to have occurred to any one in those early days of incorporation, that although it was common enough to supply water in bulk, which was not paid for by the pound or the number of feet, when they came to supply gas in bulk to the mains of another corporation or local board, there was the risk of an enormous quantity of waste over which the suppliers could have no control. The Corporation of Southport had no power over the arrangements in Birkdale—they sent so much gas through the pipes in the township, but the loss from leakage was very large. In point of fact it had turned out a very unfair bargain with regard to that portion of the gas undertaking; and, inasmuch as Birkdale was within the corporation limits, it was not easy to say why one class of consumers should incur a loss for the benefit of others. The corporation were, in a certain sense, managers for both; and if it turned out that they made an improvident bargain for one portion, those who had to pay in the other portion were entitled to seek to, and Parliament would, when it had the opportunity, rectify that bargain. The population of Southport, as well as the consumption of gas, had been on the increase. In 1861 the population was about 10,000; in 1871 it was 18,000, and as far as it could be estimated it was now 28,000; Birkdale being about 5000. The gas consumption had increased more than that. In 1865 it was only 28 million feet, in 1871 it was 60 millions, and in 1876 it was 124 millions, *i.e.*, it had more than doubled since 1871. Of the 124 millions, Birkdale took a very small quantity—viz, 15 millions. Two or three years back, when coal began to rise in price and ruin all the companies who had been imprudent in reducing their charge for gas, the Southport Corporation suffered from this cause. They had consented, as other manufacturers had done, to reduce the price of gas, which seemed safe for a time, but which became exceedingly injurious when the price of coal was raised, and accordingly they found they were making a considerable loss. They accordingly applied to the Board of Trade under the provisions of an Act passed to enable companies and corporations to raise the price of gas for a limited period. They obtained power to do so for two years, but those two years had now expired, and there were no means of obtaining power to raise the price of gas should it become necessary, except by a direct appeal to the legislation. In the town to which he had already referred—Brighton—a similar application to the Board of Trade to that made by the Corporation of Southport resulted in the company being allowed to increase their price for a time. In London, as was known, there were provisions in the Acts of some of the companies to increase the price by a different process; and the companies had availed themselves of the revision clauses during the high price of coals, as they were justified in doing. There was, in fact, no reason why gas, any more than bread or meat, should be sold below its value. The bill before the committee promised to give the corporation power to alter and enlarge their existing gas-works, and to erect new works upon the land scheduled. The price fixed in the bill was 4s. 6d. per 1000 cubic feet; and by the 39th clause, the clauses 40 to 45 inclusive of the Act of 1871, relating to the agreement between the Corporation of Southport and the Local Board of Birkdale for the supply of gas was proposed to be repealed.

Mr. *Walter Smith*, examined by Mr. Salisbury.

I am mayor of Southport. In 1867 we became a municipal borough, and in 1871 we obtained an Act for enlarging our gas-works, &c. We now want additional money for the purpose, further extensions being absolutely essential. The increase in the consumption of gas is enormous, and would be greater if we could supply more. Last year the increase was at the rate of 28 per cent. upon the previous year's consumption. There are many new houses in course of erection, in all of which gas would be taken next winter if they could get it. In 1855 our capital was £7250, in 1865 it was £14,200, in 1875 it was £78,800. The gas manufactured in 1855 was 5½ millions, in 1865 it was 28 millions, and in 1875 it was 107 millions. For some time we derived a profit from our works, but in 1873 and 1874 there was a loss owing to the materials costing us £1000 more than they had previously done. We could not make both ends meet by some thousands each year, but coal is coming back to its old price, and we are now getting a profit. It is the first time for three years that we have made a profit.

Mr. Salisbury: In other words, you expended a large amount of capital for the benefit of the ratepayers, and the ratepayers had to make up a considerable loss amongst themselves for the benefit of the coalowners?

Witness: Yes; and we had another reason. We have had to erect new works. The ratepayers wished the gas-works to be removed from the centre of the town, and we have not completed that yet; we are in such a position that we cannot do so; we must use them as long as we can until we get more new works. We have also had to put down many new mains for great lengths, and have gone a mile and a half out of the town. That is one reason why we have not made so much profit as we should; but the works are in proper order now, and we expect that we shall do better. Our price for gas was 4s., and the illuminating power 18 candles. In 1874 we obtained a Provisional Order, which allowed us to charge 3d. per 1000 more for two years; but that Order has expired. We take power in this bill to charge 4s. 6d. so as to be prepared for future contingencies; but it is not proposed to charge more than 4s., and we shall give 20-candle gas. We also allow 5 per cent. discount for payment of gas-rents within a month. The amount we had expended on the gas-works up to February last was £95,500. The new gas-works we propose to erect will be a mile and a half out of the town, at the boundary of the borough. We are under a promise to the ratepayers to remove the old works out of the town as early as possible. They are not very sightly; but I do not think they do any one an injury. We have purchased land from the lord of the manor for the purpose of the new works, and we shall have a siding from the railway into them, as well as a high road for the conveyance of coal and cannel. We shall have to expend a great deal of money in the removal of the old works, and also for extensions to meet the requirements of the town. We ask, therefore, for power to raise £230,000. I, as the Mayor, am satisfied to recommend that to the committee. Some people say it will last us for ten years; but my notion is it will not last half that time if the demand extends, as there is every probability it will do.

Tuesday, May 16.

Mr. *Walter Smith* was recalled, and further examined as to the increase in the town, and the demand for gas. With reference to the arrangement with the Birkdale authorities, he said: The local board there were formed in 1863. In 1865 the Commissioners of Southport applied to Parliament for a bill to extend their gas limits to a radius of six miles from the town-hall, which, of course, took in the district of Birkdale. The people of Birkdale opposed the bill; but before it came before a committee we had entered into an arrangement to supply them with gas for three years at a certain price, they having some mains of their own laid down. In 1867 we became a municipal corporation, and in 1868 we entered into another agreement with them for three years on the same terms as before. In 1870 we brought in a bill to buy up the Birkdale gas-mains, and to include Birkdale within our limits; and the result was that we entered into an arrangement with the local board to supply them with gas on terms agree upon, and we paid more than £1000 for law costs incident to the proceedings. We always supplied them at the same price, and with gas of the same quality, as we supplied to our own district. At present we are supplying both them and our own people at a loss, and have been doing so for the

last two years. Their gas costs them about 3s. 1d. or 3s. 1½d. per 1000, taking off what we allow them for the use of their mains, and 5 per cent. that we give them. In my opinion it is essential that the mains in Birkdale should be under our control. We should then be able to prevent the great leakage that takes place from them. We have to increase the pressure on our mains to send gas into Birkdale, because of the smallness of their pipes, and that increases the leakage. I do not think it is unfair that we should ask for power to increase the price of gas so far as Birkdale is concerned.

Cross-examined by Mr. LITTLER: There have been discussions between us on this gas question for several years. In 1863 the Birkdale people, when they first obtained power to govern themselves, got power also to borrow money to lay mains and erect lamp-posts in their district. In 1871 they sought for power to supply gas themselves; but we made an agreement with them, and they gave up their intention. That was the bargain. We are not now seeking to alter the whole thing without their consent. We want to make arrangements to buy their mains, believing it will be better for both parties. We are proposing to borrow £230,000 for gas purposes on the advice of our manager and our engineer. The Birkdale people have made some profit out of the gas they have supplied. We propose to do so in the future.

By Mr. ASPINALL: We do not seek to raise the price of gas now; we only want the power to do so, if it should become necessary.

THURSDAY, MAY 18.

Mr. *Walter Smith*, re-examined by Mr. SALISBURY.

The gas-works are our own corporate property. The mains in Birkdale belong to the local board. Whenever they require fresh mains laid down we have done it to please them. They fix upon the size of the mains themselves, and have the entire control over them. We do not supply gas to them by meter in bulk, but direct to the consumers through their mains, and get paid for the quantity shown to be used by the consumers meters. Out of that we make an allowance to the local board of 3½d. per 1000 feet; and, besides that, we give the consumers 5 per cent. if they pay their accounts within a month. It does not signify in the least to the local board what leakage there is from their mains, and that tells against us worse than anything. They have no pecuniary inducement to keep their mains in good condition. When their sewerage works were going on the leakage was very large; it is not so much now. It would be a good thing for both places if the two were incorporated; it would put an end to inconvenience, annoyance, and loss. We should then put down new mains for our own protection. We did not contemplate the circumstances of 1873 and 1874 as to the price of coal when we made the agreement of 1871. Those circumstances might arise again, and even to a greater extent, therefore we ask power to raise the price of gas if necessary. That increase would apply to Southport as well as to Birkdale.

THURSDAY, MAY 18.

Mr. *Robert Iddon*, examined by Mr. POPE.

I am the manager of the Southport Gas-Works, which are situate in East Bank Street, the new works being at Crowland. If an extension is not made to the latter works before next winter, the town will be in darkness. The largest amount we can make at the new works per day is 532,000 feet, and at the old works 277,000 feet, the total being 809,000 feet.

Mr. POPE: If you are to extend your production to, say, one million feet per day—which is a very small increase on your present consumption—about what ought you to spend for new retort-house, gasholders, and other apparatus?

Witness: For half the retort-house £10,000 has been put down. The other part of the retort-house, and the apparatus to make a million feet, and gasholders to store that quantity, would cost about £50,000 more. Up to March, 1875, we had borrowed, for our gas-works purposes, £77,215, which exhausted our powers; in fact, we have expended about £18,000 beyond our borrowing powers. If the same increase continues at Southport and Birkdale for three years as at present it will be necessary that we should extend our gas-works on a still larger scale, which would probably absorb the whole of the £140,000 sought for. In order to obtain a production of 1½ million, we should require a capital of about £161,176, including the old capital. The quantity of gas made in 1850 was 587,000 feet; in 1855, 5,457,500 feet; in 1860, 13,601,000 feet; in 1865, 28,868,000 feet; in 1870, 54,409,000 feet; and in 1876, 107,247,000 feet. The supply of gas in Birkdale is derived from Southport, and, in my judgment, it is important that the main pipes in Birkdale should be the property of the corporation supplying the gas; because, in the first place, if the mains in Birkdale belonged to the Southport Corporation, they would be able to put them in large enough to keep the pressure as low as possible at the gas-works, instead of having to work at high pressure, as we have had to do hitherto. In the next place, we ought to have some control over the mains, so as not to have to ask the Birkdale people whether we should go down and do this or that, and have them grumbling. We have, also, a district to supply beyond Birkdale, and the mains through the latter place would be the direct road to that supply. We do not go into the district at present. I do not think the mains in Birkdale at present are of a sufficient size, and this requires us to work at unusual pressure. Since the sewerage-works have been commenced in Birkdale, our pipes have been so much injured that I consider we have lost from 10 million to 20 million feet of gas there, which the ratepayers of Southport have had to suffer for, because the Birkdale people only pay so much for their gas. By our present bill we seek a maximum price of 4s. 6d. for our gas. I am not aware of any place that has 20-candle gas to make, except Liverpool, and so low a maximum price.

By Sir JOHN DUCKWORTH: We are bound to give 20-candle gas by our Act.

Examination resumed: In the spring of 1874 the corporation applied to the Board of Trade to raise the price of gas, but they were opposed very much by the Birkdale Local Board. We obtained power to charge 3d. extra, and to lower our quality 2 candles, but that concession expired on the 29th of February last. The maximum price at Liverpool is 4s. 6d., with all the advantage which they have of great works, and the facilities which they possess for obtaining coal and everything else. The actual charge in Liverpool and Bootle is 4s. 3d., and 4s. in the remaining portion of the district. The illuminating power of the gas is 21½ candles, so they are very near the 20. I have here a table showing the result of our gas profit since 1865-6:—

Table showing Gas Profits for Ten Years ending at March 21, 1875, with other Particulars.

Year.	Capital.	Gross Profits.	Interest and Sinking-Funds.	Net Profits.
1865—66	£15,372	£2,543	£1857	£787
1866—67	16,486	3,234	1967	1267
1867—68	18,797	3,427	2334	1093
1868—69	19,577	4,103	1722	2381
1869—70	22,404	3,110	1395	1715
1870—71	26,364	3,701	1398	2302
1871—72	34,525	4,346	1395	2950
1872—73	65,180	4,650	1167	3482
1873—74	65,365	3,143	3285	Loss £ 142
1874—75	77,215	2,664	3646	,, 982

By the CHAIRMAN: The reason for the sudden fall was entirely the price of coal.

By Sir J. DUCKWORTH: The accounts are made up to March 31 in each year.

Examination resumed: I believe the profit for the year ending March, 1876, will be about £5000, but that is owing to the advantage of the additional 3d., which the Board of Trade gave us, but which expired last February. We have 4610 consumers—4021 in Southport and 589 in Birkdale; public lamps in Southport 688, and in Birkdale 115.

Cross-examined by Mr. MICHAEL: One seventieth part of our capital is taken off the capital account every year and placed to the revenue account. Taking our capital at £70,000, that would be £1000 a year for the sinking-fund. The rate of interest at which we borrowed the money was from 4 to 4½ per cent, which would be a little over £3000 a year when the capital was £70,000.

Mr. MICHAEL: Supposing it were a company which had expended £70,000, and had earned £2664, that would be profit which would go into the pockets of the shareholders?

Witness: Quite so.

Mr. MICHAEL: Here it is in the hands of the corporation, and you have earned the same profit from the consumers; but you are laying up for yourselves in the future as a corporation a handsome property, to be handed over without any burden upon it?

Witness: Yes.

Mr. MICHAEL: So far as the conduct of the undertaking is concerned, it is not a loss you have sustained; but you have earned £3143 in 1873, and £2664 in 1874.

Witness: You see there has been nothing taken off for depreciation.

Mr. MICHAEL: Depreciation has nothing to do with that.

Mr. POPE: Do you mean to say that a manufacturing concern would take its gross profits and divide them, and not write off anything for depreciation?

Mr. MICHAEL: Yes. I have nothing whatever to do with a manufacturing concern. I am taking gas-works. I will go directly into the question how he makes his yearly amount.

By Sir J. DUCKWORTH: The gross profits simply represent the difference between the cost of making the gas and the money we receive.

Cross-examination resumed: The total amount of capital invested in the gas-works at the present time is £95,526, of which £18,000 has been expended during the last year. The amount of land we have is 11 acres, of which 5 acres are occupied by the gas-works proper. We are not doing anything with the remaining 6 acres at present, but we intend to do so as soon as we get power to go on with the works. The amount that the land cost us was £6708 5s. At present we have 140 retorts at the new place, and 70 at the old; they are all single, working only from one end. The largest make of gas in one day was 714,000 feet, that was about Jan. 1. At the corresponding portion of the previous year it was 647,000, an increase of 11 per cent. At the commencement of the present year we had about 15 retorts not working, and we have put up more since. A portion of the £18,000 was expended on land; we were not able to pay for the 5 acres upon which the gas-works were erected until lately. We propose to build a new retort-house at Crowland. Our storeage power is about 60,000 feet at the new works, and 120,000 feet at the old, which is about one day's supply; but I think we ought to have storeage for one and a half day's supply. On Sunday we might use about 150,000 feet less than on Saturday. We propose to dispense with our old works as soon as we possiby can, because they are worn out and unprofitable. The works were erected, I think, in 1850, and the gasholder was put up in 1854. The retorts in the old works were worked all last winter, and I am going to make them last another season, which is as long as they ought to last. I could make them last half a dozen years if I were to try, but it would not be profitable to do so, because I should have holes in them. We are going to sweep away the whole of the retorts at present existing at the old works, and when we have spent £10,000, we shall have exactly the same retort capacity as we have at present.

Witness was being further cross-examined as to the details of the expenditure of the additional £50,000 required, when

The CHAIRMAN interposed and suggested the learned counsel should state what he required, and the information could be supplied on the following day.

FRIDAY, MAY 19.

Mr. *R. Iddon* recalled, and further cross-examined by Mr. MICHAEL.

We do not intend to destroy the old retort-house until we have added the other half to the new house.

By the COMMITTEE: We have in our new works at present 140 retorts, and with the first £10,000 we propose to erect 140 more, and subsequently 140 more, making 420 in all. Each expenditure of £10,000 will include the erection of a coal shed to hold about 4000 tons of coal. There is no coal store attached to our present retort-house, and the coal is put on the ground outside. We have not had sufficient capital to erect coal stores. At the present time we keep in store about 300 tons, but we ought to have more in stock. Our average quantity is about 3000 or 4000 tons, but we are at present out of contracts both for cannel and other coal. The proportion of cannel used depends upon the quality of the coal—sometimes we require about two-thirds of cannel and one-third of coal to make the gas. Last year we employed a little over one-sixth of cannel and five-sixths of coal, because the latter was almost equal to cannel in quality, but I do not think we shall be able to obtain the same quality of coal next year.

Witness produced a plan of the works, and explained to the committee the alterations and enlargements suggested, and the following table was then handed in:—

Capital required for further extension, to admit of old works being closed down for manufacture.

Another retort-house, as before, with its coal store	£10,000
Condensers, £500; washers, £300; scrubbers, £1500; engine and exhausters, £1000; boiler, £100; purifier, £4000; meter, £1000; sundry buildings and foundations condenser, £150; washer, £150; scrubber, £100; exhauster, £150; boiler, £60; purifiers, £180; meter, £50; buildings extended, £400; boilers, £200; purifiers, £2000; meter, £200.	12,040
Two gas-holders and tanks (to hold one million feet).	20,000
Extension of mains, services, meters, railways, sidings, boundary wall, drains, offices, and engineer's residence on closing up manufacture at the old works.	7960
	£50,000

Cross-examination continued: The total producing power from our 420 retorts will be 1½ millions per day. Birkdale takes about one-eighth of the quantity of the gas we supply. I cannot say how much gas is consumed in the Southport Winter Garden and Aquarium. The length of main between our works and the commencement of the boundary of Birkdale is about 2¾ miles. Taking the Birkdale mains in, the total length from our works to the end of our supply is about 3½ miles. The initial pressure at which we supply the gas is 3 inches in the lighting season. At one point in Birkdale when it was tested the pressure was 12-10ths; at another point it was 18-10ths; and at the end of the district it was only 7-10ths. I do not know that the whole of the mains were laid by Southport and paid for by Birkdale. A number of letters have been sent by the Birkdale Gas Committee with reference to the leakage in the mains, but nothing was done by that committee, and I therefore made the defects good without any instructions, and the charge was made to the Birkdale Local Board for so doing; but I do not know whether it was paid. We had to bore the district through every five yards to find out the points where the gas was leaking. We make these leakages good as soon as we find them; but they keep breaking out again and again. I dare say that I said in 1873 that our leakage was 8 per cent.; but that was the leakage throughout the district,

which I think is an excessive amount for a place like Southport, which is a flat district, and therefore the pressure can be made more equal than in most towns. Some gas companies have 50, and some 40 per cent. leakage; but I should say that the leakage in Southport ought not to be more than from 4 to 5 per cent. The size of the leading main in Birkdale is 6 inches, and the size of our leading main is 20 inches, afterwards reducing to 18 inches, and then going down to 10 inches, where it joins the 6-inch main at Birkdale. There is also another main, of 14 inches, which joins another 6-inch main at the Birkdale boundary. I have told the Birkdale Committee that they ought to take up all their mains and put down new ones; but they have not taken my advice, although I expect they will do so. [Witness was here cross-examined with reference to the table handed in on the previous day, showing the gas profits for 10 years, &c.; but he stated he had only copied the table from the accounts, and could give no further explanation about it.] The last prices paid for coal were 16s. 6d., 18s. 6d., 20s., and 12s.; but we are not under contract at the present time. We last bought coal about nine months ago; I should think the price is higher now than it was then. The present price of the coal for which we paid 12s. is 14s. or 15s. Last year our coals cost on the average 14s. 6d. per ton. We produce nearly 10,000 feet of gas from a ton of coal. As nearly as I can make out, the residuals—the tar, ammoniacal liquor, and coke—have realized about 7s. 8d. per ton. We use in the works about 25 per cent. of the coke made. Last year the highest price for cannel was 38s.; but I had some of a cheaper sort, which cost 16s. 11d., and we used one-sixth of that combined cannel. The average for cannel would be 25s. a ton, and for coal 14s. 6d.; taken together, the average is 16s. 3d. The cost of gas to us, as far as coal is concerned, is 10·3d. per 1000. I furnish a report to our gas committee every year of the cost at which gas is made; but the accounts for the past year have not yet been audited, and I cannot deal with them until that has been done.

Mr. MICHAEL: Is is not the fact that, upon the faith of the accounts for 1875-76, you have reduced the price to the consumers?

Witness: No; we are bound to reduce the price by Act of Parliament.

Mr. MICHAEL: Have you made any estimate of the expenses to enable you to tell me, per 1000 feet of gas, what is the cost of distributing it to the consumers meters?

Witness: I will give it you when the accounts are made up. I cannot give you a correct statement otherwise.

Mr. MICHAEL: Then you have come here to ask for £230,000 without giving us any information of how you have expended money during the past year?

Mr. SALISBURY said he would undertake, if his learned friend would say what information he wanted, to produce the proper person to provide that information.

Mr. MICHAEL said that if the witness were allowed to be recalled, in order that he might be cross-examined on the accounts, that was all he required.

Mr. CHANDOS LEIGH said he would defer his cross-examination until the witness was recalled.

Dr. *Henry H. Vernon*, examined by Mr. SALISBURY.

I test the illuminating power of the gas. For the last 15 months it has averaged nearly 23 candles. [A paper was handed in, showing that the average of 33 fortnightly examinations, embracing 210 tests, from Jan. 14, 1875, to May 4, 1876, was 22·79 candles.]

MONDAY, MAY 22.

Mr. *Iddon* was recalled, and, in reply to Mr. LITTLER, said he wished to make a short explanation. He found the accounts for the year ending March, 1876, had been examined, and he was told they were substantially correct. He then put in the following statement of accounts:—

Gas Revenue Account for the Year ending March 31, 1876.

Gas sold, 117,862,400 *Feet* = 9716 *Feet per Ton.*

	£	s.	d.	Per 1000 Feet Gas Sold. d.		£	s.	d.	Per 1000 Feet Gas Sold. d.
12,126$\frac{13}{20}$ tons of coal at 16s. 7d.	10,056	10	11¼	20·47	Gas sold, 117,862,400 feet	23,857	1	0	48·58
Salaries and wages	6,127	19	1¼	12·47	Coke	2,482	5	8½	5·06
Lime and oxide of iron	382	5	5	00·79	Tar	1,451	10	10½	2·96
Repairs and other expenses	1,179	12	7	2·41	Liquor and naphtha	856	13	1	1·74
Rent, rates, and taxes	714	2	8	1·46	Fittings	598	8	1	1·22
Repairs to retorts	356	7	3¼	00·73	Rents, meter fees, &c.	355	17	9	00·72
Carting of coal, coke, &c.	1,450	13	6	2·95					
Balance	9,334	4	11½	19·00					
	£29,601	16	6	60·28		£29,601	16	6	60·28

	£	s.	d.			£	s.	d.	
Interest on loans	3,444	13	11	7·02	Balance	9,334	4	11½	19·00
Sinking-fund on £13,486 at 1-40th	337	3	0	00·68					
Balance	5,552	8	0½	11·30					
	£9,334	4	11½	19·00		£9,334	4	11½	19·00

TUESDAY, MAY 23.

Mr. *Iddon*, recalled and again cross-examined by Mr. MICHAEL.

We had power by our Act to raise £77,000, and the dividend earned upon that amount would, I dare say, be at the rate of 12 per cent. per annum. We have absolutely expended in excess an amount which brings our capital invested in works to £95,526, and upon that we have earned 9½ per cent.

Mr. MICHAEL: I understand you to say that the quantity of gas you obtained from a ton of coal was 10,000 feet, and that you lost in working 8 per cent.; will you explain how it is that the quantity of gas sold, taken out of a ton of coal, comes to 9718 feet, showing only a loss of 2·8 per cent.

Witness: I think that is not so. If you calculate you will find that the loss is 9 per cent. and a little over.

Mr. MICHAEL: The quantity you have sold is 117,862,000 feet, and the tons of coal used 12,126. In order to determine the quantity you have made per ton, must I not divide the total quantity sold by the tons of coal used?

Witness: Yes; but it works out to 128 million if you do that. The quantity of gas made per ton is 10,616 feet. I had not the figures before me when I said 10,000.

Mr. MICHAEL: You have given me in figures that your coal cost you 16s. 3d., and that the residuals returned you 7s. 8d., leaving a net cost of 8s. 7d. per ton of coal; and now you say that the coal cost 18s. 11¾d., and that the residuals bring you in 7s. 10d., so that the net cost of coal is 11s. and a little more than three farthings, making a difference of 2s. 5d. from the figures you gave before?

Witness: If you take the balance-sheet you get 16s. 7d. as the average for the two.

Mr. MICHAEL: You have given first the tons of coal, but you have put down below "carting of coal, coke, &c., 2·95;" that must be added to the cost of coal.

Witness: I have not worked it in that way. The £1450 expended on carting of coal, coke, &c., includes 9d. per ton for taking the coal down to the new works, and 3s. 4d. for carting the coke. The sidings of the railway are about half a mile from our works.

Mr. MICHAEL: Then I must increase the cost of the coal to 18s. 11d. from 16s. 3d., because these are costs incidental to your coal?

Sir J. DUCKWORTH: Not the coke. The carting of the coal, of course, adds to the price of the coal.

Mr. MICHAEL: Before we can arrive at the price of coal we must deduct the price of the residuals obtained. Anything that is a cost to them on their residuals is really a charge upon the coal; of course, it diminishes their source of profit. (To witness): Take it in your own way; it shows that upon every 1000 feet of gas which you have sold you have gained 19d. Then we must deduct 19d. from 48·58d., and we get 29d., or 2s. 5d., as the entire cost to you of making and distributing your gas?

Witness: Yes; that is the gas we have sold.

Mr. MICHAEL: I have worked out your salaries and wages, and I find that they exceed 10s. per ton. Compare that with the London 5s. 3d., and tell me the reason for the difference?

Witness: I have not seen the London accounts, but, as far as our own go, I believe the wages are very low. I cannot give any explanation of the difference, but we work as economically as we can.

Re-examined by Mr. SALISBURY: In our part of the country the wages for workmen are very high. They are constructing very large docks at the north end of Liverpool, and are advertising all over the neighbourhood for working men, and are paying high wages. Our make of gas last year was exceptionally good. We had not made an average of 10,600 feet before that year. That is, I believe, in excess of anything you will find at any other place. During the current year we shall have to provide a sinking-fund, which was not done last year.

Mr. CHANDOS LEIGH: There is a sinking-fund here?

Witness: On the £13,000; that is capital raised under the Act of 1865. Under the Act of 1871, we have not deducted anything for sinking-fund, but we shall have to do it in the current year on about £82,000.

By the COMMITTEE: We allow 5 per cent. discount if accounts are paid within the month, and that brings the price down from 4s. 3d. to 4s. 0½d. We have not set apart any sum for depreciation, but I think we ought to do so, in which case we should have less profit.

Mr. *George Anderson*, examined by Mr. SALISBURY.

I am consulting engineer to the Southport Corporation. In my opinion, it is absolutely necessary that the gas-works there should be extended; it should have been done before. The increase in the consumption of gas has been very great. Between 1871 and 1872 the increase was equal to 10·78 per cent; the next year, 12·24; the next, 29·76; and last year, 27·83. It is such a rate of increase as I do not believe is to be paralleled in the whole country. The usual rate is about 8 to 10 per cent., and that is considered very good; in many places it is only 5 per cent. During the last two years, three or four very large establishments for the entertainment of the people have been built, and many other improvements are in progress, which will greatly add to the consumption. I do not think too large a sum has been inserted in the bill for gas-works, unless the corporation are to apply to Parliament every two or three years, which I do not think is prudent. The new works at Crowlands are good as far as they go, but they want a great deal done to them yet. They are now too small, although they were large enough two years ago. One reason why it is desirable to remove the old works is because the townspeople desire it. Another reason is because they are old works, and gas cannot be manufactured so cheaply by 2d. or 3d. per 1000. I know that an excess of £18,000 or £19,000 has been made in the borrowing powers, but if the corporation had not made that expenditure they could not have supplied the gas. The £50,000 which has been mentioned is money absolutely wanted, and ought to be expending now. That expenditure would give them a manufacturing capacity of considerably more than double what they have now, and I should say would enable them to go on for four or five years more. Regarding the supply of Birkdale with gas, at the present time, as I understand it, the main pipes in the village belong to the local board there. Birkdale, as well as Southport, has been very much extending, and the pipes which were put down some years ago, although no doubt large enough in the first instance, are now much too small, and require a heavy pressure to be worked in Southport in order to give a sufficient supply to the consumers; and that is part of the reason why the corporation are now laying a pipe which will be very much independent until it reaches Birkdale. I think it is a very bad arrangement for the pipes to belong to the Local Board of Birkdale, while the Southport people have to supply the gas through them; because, if any leakage occurs in Birkdale, it is nobody's interest to trouble himself about it, and the loss goes on until some person kind enough to go beyond his business may tell the people of Southport, or the people of Southport may go themselves and find it out. If the matter remains as at present, Birkdale might decidedly be supplied by meter, and I should have no objection to that; but then a difficulty arises. There is a large district beyond Birkdale, which will doubtless soon be built on, and the pipes must be laid through Birkdale for that purpose; and in doing so, if the pipes were all under one system of management, it could be arranged to feed off Birkdale as they went along, and not have to go right through it without doing anything. In 1871, before the Birkdale sewerage was laid down, the total amount of unaccounted-for gas was 4,300,000 feet. In 1872 the sewerage works were in progress, and the leakage got up to 6,500,000 odd; in the succeeding year, 1873, it was a little less, 5,300,000; but in 1874 it rose to 6,900,000; and in 1875 it was very bad, for it got up to 12 million feet, so that there were about two or three times as much gas lost in 1875 as in 1871. This shows the necessity for the pipes being in the hands of the Southport Corporation, because when the men are laying the sewerage, they have to go very deep in some places, and the pipes are often interfered with, and it is simply impossible, even with good management, to prevent this in some degree; but if there is no proper watching, of course it is very much increased. With regard to the price of gas, it is proposed to increase the maximum to 4s. 6d. for 20-candle gas; and I say it is a low figure for a maximum according to what may arise in the future, from what I know has arisen in the past. The Alliance Gas Company of Dublin had a 20-candle maximum, and they had 5s. 6d. by Act of Parliament. They tried it for two or three years, and the losses were so great that they applied to Parliament three years ago and had the illuminating power reduced to 16 candles, and the price to 5s. The consequence has been that they are now paying 8½ per cent. When they had to supply 20 candles, they had to use from 40 to 60 per cent. of cannel, and now they use, perhaps, not above a quarter of that. In one respect cannel is inferior to other coal—it not only costs more to purchase, but there is less money received for the coke; but there is a better quality of gas. I have a list showing the illuminating power fixed by Parliament in nearly 300 towns in the United Kingdom. In 16 cases the illuminating power was fixed at 12 candles; in 6 at 13 candles; in 201 at 14 candles; in 19 at 15 candles; in 11 at 16 candles; in 1 at 17 candles; in 3 at 18 candles; in 5 at 20 candles; in 4 at 25 candles; and in 1 at 30 candles. I have also a statement of the price and illuminating power fixed by Act of Parliament in the following watering places, similar to Southport:—

	Price.	Candles.
Ramsgate	4s. 0d.	14
Torquay	5 6	14
Hastings	4 7	14
Harrogate	5 0 and 4s. 7d.	14
Leamington	4 0	14
Scarborough	4 6	14

By the COMMITTEE: The price of coal at Ramsgate is about 15s. to 16s., according to the freight. I should say there is no argument to be founded upon the particular year in which those bills were obtained. On the contrary, the price of everything is rising, and if the bills were obtained at times when prices were cheap, it would rather argue that coming later, when prices were higher, the price put here would be rather too low for us.

Cross-examined by Mr. MICHAEL: I should say there is no likelihood of any diminution in the ratio of increase in Southport for the next ten years. We shall have to take down that part of the old works which refers to manufacture, because we shall not be able to use that portion. The corporation may or may not, as they think best, in an economical point of view, take down the gas-holders. We shall destroy as little as ever we can, and utilize as much as we can. We have not proposed to expend any money until it is required. I do not know what, in this extensive district, may happen as to the extension of houses. When houses are built, mains must be laid; whether they will be built or not, I cannot say, but we must provide for the contingency. I would not pretend to answer the question how much it would require in order to double the consumption at the end of five years, because Southport is an extraordinary place as regards gas-works. In the first place we have to demolish our old works, and in the next place we are increasing at such a rate that it is impossible to foresee and guard against the loss which would arise if you were to extend at a slow rate. I consider that £146,000 will be necessary during the next five years, but as to how it is to be spent, or what is to be done with it, the question might as well be asked what size pipe I should like. If it only takes £100,000 I shall be all the more glad. The private supply of gas is about nine times as much as the public supply. I do not know the amount supplied to the places of amusement, as they are all private consumers.

By the CHAIRMAN: We always describe as private consumers those who are supplied by meters in theatres, concert-rooms, or public houses. Public consumers are those who burn in the outside streets; that is the distinction.

Cross-examination resumed: The loss of pressure per mile of main is another wide question. There are no two cases alike that I know of. I should say in Southport it would be three-tenths or four-tenths. I infer that a great deal of the leakage occurs in Birkdale, from the fact that it began immediately after the sewerage works were commenced. I know very well what the loss is in other towns, and I know also from the manager that he has stopped a great many escapes of gas in Birkdale, and also that the leakage has gone down. Of course it is only an inference, but it is a very strong one. Our supply does not extend beyond Birkdale at the present moment, but we expect it to do so, because it is land of the same description and I think there are some houses about to be built.

By the CHAIRMAN: I would not say that the gas-works in the centre of the town are by any means unhealthy; but, at the same time, there is a prejudice in people's minds against gas-works, and we must look to that prejudice. It is a thing that has been talked about for some years.

By the COMMITTEE: The smell coming from them is objectionable to some people. I do not object to it, but I do object to the smell I often find in the Strand as I pass Rimmel's shop. It is a matter of opinion.

By Mr. SALISBURY: I do not know that the question of removing the gas-works was fought at the election in 1869; but I know that the counsellors who were upon the Gas Committee made it a *sine quâ non* that I ought to insist upon it in advising the council. There is a strong feeling about it at Southport.

Mr. *Iddon* was recalled and examined by Mr. SALISBURY to prove the correctness of the letters sent to the Birkdale Local Board, complaining of the leakages in the pipes in their district.

Mr. *Thomas Hawksley*, examined by Mr. SALISBURY.

I am well acquainted with the gas-works at Southport, and I think they ought to be removed from the centre of the town, which is a pleasure place. For a town of that magnitude, including both Southport and Birkdale and Southtown, there certainly is no reason why there should be two stations at work instead of one. The works were well enough placed originally, but Southport has, within my knowledge of the place, I should think, quadrupled in population. At the present time this most unusual state of circumstances, in regard to the distribution of gas, occurs, that whereas in manufacturing towns of great magnitude it very rarely happens that more than about 15 feet of gas per head is distributed on a winter's day, here already there is the remarkable quantity of about 24 or 25 feet per head distributed. In my opinion it is necessary that the corporation should have additional capital to meet the additional requirements. In point of fact, at present prices of construction, between 2s. 6d. and 2s. 8d. of capital is required in respect of every cubic foot to be delivered on the day of greatest consumption. I am aware it is proposed to increase the maximum price from 4s. to 4s. 6d.; but that means only to increase the limit beyond which the consumers cannot be charged under any state of circumstances. It does not at all follow as a matter of course that the price charged to the inhabitants will be increased, and I should think it is very likely that for some years it may rather decrease than increase. But then we have had experience of what has happened during the last few years by a most unnatural combination between masters and men, and the price of coal has gone up two or three times more than its normal rate in consequence. The price of labour, as represented partly by wages and partly by the amount of work done, has nearly doubled since 1850; the amount of work done for the increased wages being very small. As to the present mode of supplying Birkdale, it is a sort of divided power. Southport has the obligation of supplying the gas, and Birkdale the privilege of consuming it. The Local Board of Birkdale control the means of distribution, and of course the illumination of the streets.

Mr. SALISBURY: Do you approve of our application to Parliament to obtain the usual powers that gas companies have over their entire district—the sole control, in fact?

Witness: In such cases as this—not like Manchester and Salford, where each place is very large, but where one place as compared with the other is a mere village—it would be beneficial to both places that the village should be merged into the larger community for the purpose of government and regulation.

Cross-examined by Mr. MICHAEL: I know that Southport laid down the pipes, and that Birkdale paid for them, but I was not aware that the amount so paid was about £3000. I also believe that the Southport Corporation, acting as a gas company, repair the pipes when necessary; but I do not think that arrangement was ever for the benefit of Southport, but rather the contrary. I think it was for the benefit of Birkdale, in the particular sense that Birkdale had probably a desire to maintain what it called its own independence. The two places do not go on comfortably together, but I do not think they had, therefore, be better separated by a divorce. I think what is wanted is really to abolish the difference of interest between the two parties and to marry them more effectually.

Mr. MICHAEL: How much would you say, from your experience of Southport, should be the loss of pressure per mile of main, looking at the position of the gas-works and of the mains, the size of the mains, and the supply of gas from them?

Witness: I do not think you can estimate in that way. What is proper in all cases is that the pressure at the remote extremity, however far that may be, should be sufficient for the ample supply of the consumers. There is no general loss per mile. If the main is a very long one, you must make the diameter so much larger, that the loss made in tenths of inches per mile shall be less than it would be if the main were shorter. For instance, in some cases we are enabled to do with half an inch of loss upon a mile; in other cases, if the main is very long indeed, we could not do with more than a quarter of an inch. The way in which we manage that is to give an inch more of diameter to the pipe, or some increased diameter, so as to diminish the friction.

Mr. MICHAEL: Supposing a gas company started with 30-10ths of pressure, and in the first two miles had lost 18-10ths of the initial 30-10ths, to what would you attribute such loss?

Witness: I should attribute the loss to a very considerable consumption at or near the extremity of that main; but in the case which you suggest, there would be a residual pressure of 12-10ths, which is even more than is necessary for the most efficient lighting which you can imagine, so that up to that time you might, surely enough, pronounce that the mains were large enough for the supply.

Mr. MICHAEL: When gas is started at such an initial pressure as 30-10ths, does it tend to produce leakage?

Witness: Supposing leakage to exist in any sensible quantity, the leakage near home would be considerable, because the 30-10ths of pressure would there be operating within the pipe to force the gas through any crevice which might exist. But the matter must be judged of by actual results, and in the present case the leakage is very small—I think about 9 per cent.—the average leakage throughout the kingdom being about 15 per cent. It must, also, be borne in mind that, of what is called leakage, probably not more than one-third is due to that cause. Part of it is usually due to inaccurate registration of the meters, part of it to defective fittings in the service-pipes, and so on, not under the control of the corporation. I attribute the very large increase in the consumption of gas in Southport, first of all, to the particular way in which the town is inhabited—by a very respectable class of people, who all burn gas, and who burn it largely; secondly, to the gas being of good quality, thus encouraging consumption; and thirdly, to the moderate price at which gas of that quality is supplied. There is no doubt that if an exorbitant price were charged, it would diminish consumption. In laying down gas-works now, it is usual to design them in blocks, so that we can add one part to another, and make the general design for two or three times the consumption which exists at the time the design is made, and then to build them in blocks, just as you would build barracks where you do not know the number of troops you will have in them. That is a very economical mode of procedure.

Mr. MICHAEL: How does that ensure economy? Can you give me any per centage? We have here, in round numbers, the consumption at the present time of 120 millions, and, according to the statistics, that is likely to be doubled in five years?

Witness: The 120 millions has nothing to do with it. The question is, what is the demand on the day of greatest consumption, and, as I understand, that is about 750,000 feet. What I should do in that case would be to build a duplicate work—duplicate in power, but not necessarily so in construction. I should build a duplicate work at once, in order to be able to meet the demand which is to come within five years. Then, in three years—two years before the exhaustion takes place, I should start another work of, perhaps, the same magnitude. Gas-works, as a rule, cost nearly in proportion to their magnitude—there is very little difference. To meet the probable supply, at the end of five years, of 1,400,000, or 1,500,000 feet, would require about 150 retorts, producing between 4000 and 5000 feet each; but, in order to allow for a few dead ones, I should put in 175, and for double the quantity I should want 350. In small places an excess of 20 per cent. is necessary; in larger works, 15; in great works, about 10; and in very large works the supply can be done with about 7½ per cent. excess. At the present cost of gas-works, including all the mains, gasholders, retorts, land, and everything, a perfect gas-work cannot be erected under £450 per retort. If there are 350 retorts, that, of course, would be £140,000 expended in that way in the first block, including present capital; and it would go on in the same way continuously. Even supposing the rate of increase did not continue the same, I should only make an allowance for greater or less increase.

Mr. MICHAEL: Will you tell me how much I ought to put down per retort, excluding the building in which it is placed, but including all the apparatus after production—that is, the retort and all connected with the retort-house, and the hydraulic main, and all matters short of storeage?

Witness: At the present price it would be about £30 per retort.

Mr. MICHAEL: How much, on an average, would you put for the house per retort—I do not want an ornamental structure like the Southport Pavilion?

Witness: But I must put some apparatus into the house. I suppose £25 per retort for the house alone.

Re-examined by Mr. SALISBURY: I have looked both at the cost at which the gas was made, not only generally, but departmentally; I have looked at the amount of leakage, and I have taken into consideration the whole of the manufacturing and distributing circumstances of the place; and I distinctly say that the gas-works are very economically managed, and that they are conducted with skill and judgment. In Southport there are a large number of places of public entertainment, where large quantities of gas are consumed. Besides that, there is a very unusual circumstance, and that is, one public lamp to every forty inhabitants; generally speaking, the public lamps are only one to 70 in most towns.

After some evidence affecting other parts of the bill, the case for the promoters was closed.

The COMMITTEE, having consulted, determined that, as far as regarded the incorporation of Birkdale, the preamble of the bill was not proved.

WEDNESDAY, MAY 24.

Mr. LITTLER, on behalf of the Birkdale Local Board, said that the decision of the committee against the incorporation of Birkdale had placed that body in a very different position, and he now took three objections on their behalf. With regard to the gas question, the Birkdale Local Board had, in 1871, discontinued proceeding with a Provisional Order which they had obtained, upon an agreement being made that the Southport Corporation would supply them, the latter obtaining in return certain privileges and advantages. Because the corporation did not now like their bargain, he contended that the committee could not reasonably empower them to abrogate it without the consent of the local board; but he was willing to relinquish the right of the local board under that agreement, on condition that they were placed in the same position as that which they occupied before the contract was made—viz., that they should be placed in a position to supply their own gas within a reasonable time, the corporation being required meanwhile to furnish them with a supply. On this condition Birkdale would be willing to release them from their bargain, and the committee could sanction such an arrangement. On behalf of his clients, he declined most respectfully to go into a discussion of past legislation which was based on the agreement made between the parties, and which, as the corporation alleged, had turned out unfavourably for them.

Mr. SALISBURY said, of course, if it was thought desirable that the corporation should possess, in the interests of the public, the gas property of the Birkdale Local Board, it would be upon certain terms and conditions to be hereafter settled when they came to clauses. The promoters were prepared, should the preamble be passed, to meet the local board on that point.

Mr. MICHAEL said the status of the parties was entirely altered by the decision of the committee on the previous day, as the whole bill proceeded on the assumption that the promoters would get consent to the incorporation of the outlying district. The moment the committee decided against that, the course proposed by the corporation was one entirely unknown in Parliament—viz., to proceed to obtain the alteration of an agreement without the consent of one of the parties to it, and without cause shown.

The CHAIRMAN: You should not say without cause shown; that is the very point.

Mr. MICHAEL said the cause shown was that the agreement was not advantageous to the corporation. The terms proved more onerous than they had expected, and therefore they wanted to be released from it.

After hearing Mr. SALISBURY, the Committee decided to go on with this part of the bill.

Mr. ASPINALL then opened his case on behalf of the inhabitants of Southport who apeared on the petition. With reference to the gas question, he said he objected to the enormous capital proposed to be raised, and to the clause in the

bill by which the maximum price of gas was increased. The evidence for the promoters had disclosed no case for asking for so large a sum as £230,000, nor for a permanent increase in the charge for gas. Upon these points, however, the committee would hear Mr. Michael who could deal better with the subject.

Dr. *John Laing*, examined by Mr. ASPINALL.

I am a medical man, residing at Southport, and have been a member of the corporation six years. I do not think it desirable that the corporation should have power to raise the price of gas. They made a profit last year of from £5000 to £8000, and they have customarily made a profit within the period of my recollection, except during the two years of the coal famine. Then they made a small loss. I think their present maximum price is sufficient. I do not see any necessity for the large amount of capital they are seeking to raise. It will relieve them from coming to Parliament again for some years. They are fond of coming.

Cross-examined by Sir. E. BECKETT: My reason for saying that they do not require this capital is that, if I understand rightly, they did not use all their gas-making power last winter. They have more apparatus put down than they have occasion for. I do not believe in Southport increasing to the extent some people think it will. I heard Mr. Hawksley's evidence, but I did not pay much attention to it.

Mr. *Alfred Penny*, examined by Mr. MICHAEL.

I have had very large experience in all matters in connexion with the manufacture of gas, and have been lessee of large gas-works. I have made an estimate of the cost of producing gas at the present time at Southport. I have taken the cost of coal at 16s. 3d., and I take from that 7s. 8d. as the sum received for residuals, leaving the net cost of coal 8s. 7d. I add 12s. per ton of coal for working expenses, because that is the sum it costs the largest and most expensive working companies, although there are many companies where it costs much less. Adding the two together, we make the total cost 20s. 7d. for carbonizing a ton of coal. That will include every expense except the sum that would be paid either in the shape of interest on capital or dividend to the shareholders. Mr. Iddon's balance-sheet showed that the corporation sold 9702 feet of gas for every ton of coal carbonized, and, dividing 20s. 7d. by 9702, works out to 2s. 1·4d. for each 1000 feet of gas sold. Anything between that and the sum charged would be the profit which a company would derive from their undertaking, per 1000 feet of gas sold, and from which they would pay either dividend or interest, as the case may be. In the present case money is borrowed, on which interest has to be paid, and a sinking-fund provided. I have taken the whole sum they have expended, and not the sum they have the power to raise—£95,526, or £18,000 in round numbers, in excess of their powers. I have taken the interest at 4½ per cent., and the sinking-fund, which they say they have paid, £337 3s., giving a total of £4635 17s., and have divided it out with 118 millions, and I find that will give a sum of 9·42d. Owing to an agreement with Birkdale, an allowance of 8d. per 1000 feet is made to the consumers there, 4½d. of which is for the use of the mains, and 3½d. as a sort of bonus, which works out upon the whole sale of gas in Southport to ·88d. Adding that sum to the 9·42d. and to the 2s. 1·4d. works out to 35·34d., whereas they have been charging 4s. 0½d., and, therefore, they must be earning a very large surplus profit. For gas companies to duplicate themselves within eight years is a very fair rule to take, but in Stockport they have done so in five years, and, therefore, they require to spend large sums of money in order to provide additional making and distributing power; but that would enable them to earn greater and more extended profits upon the capital expended. That increase might be an argument for increasing their capital, but not for increasing the price of gas per 1000 feet. I do not know of any reason why capabilities should be given to the corporation to charge a higher amount than at present, except for a taxing power. I cannot imagine what they want the other 6d. for. Birkdale must be looked upon as a consumer entirely diverse in its interest from Southport, and if that power is given it might be exercised unfavourably to the interests of the former. The length of mains in Birkdale is about 12,000 yards, and their value about £3400. There is a small quantity of 14-inch, and a small quantity of 12-inch pipe; but they range generally from 6 inches to 2 inches. It is quite impossible to tell what quantity of leakage is due to Birkdale and what to Southport; but I should consider it would be less in Birkdale by reason of the less pressure there. It has been made the subject of complaint that the mains are too small in Birkdale, and that the pressure is low; consequently, the leakage would be less there than in Southport, where the pressure is much greater. There is a loss from friction of 18-10ths in the two miles intervening between the works and Birkdale itself, and the corollary would be that the loss would occur in Southport itself. There would be no difficulty in laying down another leading main to supply Birkdale; but when I know that in the weakest part of Birkdale there is a pressure of 7-10ths, there is not much to complain of, inasmuch as 8-10ths is the prescribed minimum pressure. If difficulties should arise, it would be easy to cut the district off, and allow Birkdale, under the Public Health Act, to supply itself with gas. It is in the Stockport district; but Parliament, who gave them that district, can take it away again. Looking at the balance-sheet and my estimate of the cost of gas, I cannot see any reason why they should wish to break the bargain, because it is a profitable one still. Taking 4s. as the initial price, by giving a discount of 5 per cent. to Birkdale, which they do in common with all the Southport consumers, that comes to 2½d. per 1000 feet. Then they allow them 8d., which makes 10½d., so that in reality they receive from the Birkdale people 3s. 1½d. per 1000 for their gas; but Birkdale has provided the £3400 necessary to put down the mains. I assume that it cost 4½d. per 1000 feet to pay the interest and sinking-fund upon the mains, because that was the sum agreed upon between the parties. They have allowed that to Birkdale in lieu of spending the money themselves in putting down the mains, and, consequently, the actual price of gas the Birkdale people pay is 3s. 6d. per 1000, which I consider is a fair sum under all the circumstances of the case; if my figures are correct, it only costs them 3s.

Cross-examined by Sir E. BECKETT: I have not gone into the question at what rate Birkdale could make their own gas. They could not make it as cheaply, with the comparatively small quantity they want now, as the Southport Corporation can make it. If you ask me, as an engineer, what harm there would be in the Corporation of Southport taking the mains and paying for them at their value, I should recommend the authorities at Birkdale to part with them if the Stockport Corporation are willing to give them the 8½d. which they now receive.

Sir E. BECKETT: I do not say 8d., as part of that belongs to the mains. I put 3½d., which is the bonus—we taking the mains at a valuation.

Witness: There are many questions mixed up with that which I should be unwilling to give an opinion upon without consideration. Taking the illuminating power and the price together, I have nothing to complain of in them.

Sir E. BECKETT: Suppose we had not volunteered that reduction in price in 1871 which we did, not knowing what was to happen about coal, would there be any kind of reason in calling upon us to reduce our powers?

Witness: There would be no reason to make an appeal to you by coming to Parliament, but if your balance-sheet shows that you can make the profit you have, and with the reduction in the price of coals, it is clear that you can make gas cheaper. According to the table put in, you have made, for a continuance of eight years, an average of 13½ per cent. profit.

Sir E. BECKETT: You know there have been such large fluctuations that it is no use talking about an average. You know we were working at a loss for two years, and that loss would have continued if we had not been allowed to raise the price?

Mr. MICHAEL: We do not agree with that. You say you made a loss, but we say, according to your own engineer, that you made a large profit.

Cross-examination resumed: According to your own figures there was an apparent loss for one year of £142; but, inasmuch as a portion of the profit you did make went to the sinking-fund, I cannot conceive that that, in any ordinary sense of the word, would be a loss.

Sir E. BECKETT: That explanation may be so, but we had to pay the sinking-fund, and if we do not pay it, the people will have to be taxed.

Witness: If you pay it long enough you will have no capital to pay on at all. The sinking-fund you were then paying was to last 40 years.

Sir E. BECKETT: But whenever there is a fresh sum of money borrowed, there is a fresh sinking-fund to pay, so there is no possibility of there being no sinking-fund to be paid, in any conceivable time.

Witness: It will only increase by borrowing more capital and increasing your works, and, consequently, increasing your profit.

Sir E. BECKETT: Have you anything else to say about it except the sinking-fund?

Witness: You say you made a loss; you paid your interest upon your borrowed capital, and before a company can make a loss they would have no profit to give to their shareholders.

Sir E. BECKETT: We are not like a company; we are a corporation, and we must either reimburse ourselves out of the gas profit, or we must have taxation.

Witness: I will say you made a very small loss.

Mr. MICHAEL: If the sinking-fund is included, I say so too.

Sir E. BECKETT: I do include the sinking-fund, because it will practically go on for ever.

Cross-examination continued: I do not know whether Mr. Iddon's statement that the cost of carbonizing, manufacturing, and delivering to the consumers meter, every ton of coal is 14s 5d. is untrue or not; but I say it is much in excess of what it costs in other places. I do not say it has not been spent, but it has not been spent in making gas. The Phœnix Company are working at a great deal more than 12s.; but there are others working at a much lower rate. The South Metropolitan Company carbonize their coals; and every working charge whatever, except dividends, is paid by 10s. 6½d. per ton of coals.

Re-examined by Mr. MICHAEL: The average of the whole of the London companies is 12s., and a small decimal per ton of coals. The British Company at Norwich do the same work for 7s. 4d. per ton of coals.

Mr. MICHAEL: To come to some matters not in dispute, the account put in by Mr. Iddon shows that they have realized a total profit during last year of £9334 4s. 11½d. over the whole year's working, leaving a margin of no less than £5552 to meet contingencies in the increase of coal, wages, and other matters.

Sir E. BECKETT: There is more sinking-fund out of that.

Mr. MICHAEL: These are accounts up to March 31, 1876, showing a balance of £5552. The sinking-fund already expended would be continually being exhausted, and that portion of the capital would be set free, and therefore there would be a constantly increasing amount of money at the disposal of the Corporation of Southport arising from the revenue on gas.

Witness: Yes. To begin with, and, taking one-seventieth every year, they will have the next year a less sum upon which to pay the interest. The interest would be continually diminishing, and after the expiration of the first 70 years all that capital would be free from both sinking-fund and interest, and so on every five years with additional money expended, and earning additional revenue. According to their own statement there is a balance shown of 19d. profit in every 1000 feet of gas made, and according to my estimate there is a shilling made after all expenses are paid.

Mr. *Thomas Newbigging*, examined by Mr. MICHAEL.

I am a gas engineer, and have had considerable experience in the management of gas-works. I do not see any reason in the circumstances stated to the committee why there should be an increase in price. I agree with Mr. Penny as to the price at which gas can be produced. I have examined the pressure of the gas as supplied to Birkdale, the difference between the inlet and the outlet—about a mile—was 4-10ths, which was very small, considering they commenced with an initial pressure of 30-10ths at their works. There are no exceptional circumstances which make it a difficult or losing matter for Southport to supply gas to Birkdale.

Cross-examined by Sir E. BECKETT: There need be no difficulty in supplying Birkdale from the present mains. If the existing agreement is abrogated, it would be unfair to Birkdale; because the people there have at present an advantage under the existing agreement, which they would forfeit.

Sir E. BECKETT: Can you give any reason why Birkdale should be any better off? We should have the risk of the concern, and they would have no risk.

Witness: I consider that Birkdale should have an equal advantage with Southport in proportion to the expenditure of capital. The consumption of Birkdale is one-eighth part of the total consumption, and they have only 1-24th part of the profits. I think that any works producing 20 million cubic feet of gas, can produce it quite as cheaply as much larger works. The present consumption in Birkdale is about 15 millions, so it could not be made quite so cheaply; it would probably cost 2d., or perhaps 3d., per 1000 more. I consider the heavy initial pressure which exist at the Southport gas-works is due to their own arrangements for supplying Birkdale. If that district was supplied in a proper and natural way from the south-eastern side, the pressure might be materially reduced at the gas-works, and Southport have admitted that they have laid a 20-inch main on that side. Supposing Birkdale to be supplied from that main, I believe the pressure could be reduced to 18-10ths or 20-10ths. I consider the mains in Birkdale are sufficient at present; but I would not object to a few of them being enlarged. I expect the neighbourhood to increase, and then the mains would require enlargement.

Re-examined by Mr. MICHAEL: It is clear that there is a loss of 18-10ths in Southport itself. The mains through Southport are too small to supply Birkdale, and therefore, if they have any complaints, they might cut off Birkdale altogether, and serve it with a new supply of its own. I may also say that, owing to having to maintain this exceedingly high pressure, the consumption of gas in Southport is greatly increased. On the mains nearest the gas-works I have not the least doubt that the gas becomes exceedingly heavy, so that it would be an advantage to the Southport people themselves to bring the new main into use for the supply of Birkdale, and reduce the pressure.

Mr. *John Docksey*, examined by Mr. MICHAEL.

I am chairman of the Highway Nuisance Committee of the Birkdale Local Board, and was one of the promoters of the Birkdale Gas Order in 1870. We obtained a Provisional Order from the Board of Trade, by which we should have been able to conduct the gas undertaking. At that time we were asked to meet a deputation from the Southport Corporation, and we did so. The result of that interview was the arrangement for the supply of gas we are now under. Those terms were embodied in the Southport Improvement Act, 1871, and we then withdrew our Provisional Order. We considered that arrangement a final settlement of the gas question, or we should not have relinquished our Provisional Order. We also gave them the privilege of laying mains through Birkdale to supply the district beyond. I object to our pipes being purchased and taken over by the Southport Corporation, in anticipation of having works of our own at some future period. Another objection is, lest it might be made the ground for an application to incorporate our district with Southport.

Cross-examined by Sir E. BECKETT: If Southport is dissatisfied with us, let them give us legal notice, and we will provide works of our own. We shall be very glad if they will do so, as it would be better for the township of Birkdale to have its own supply. I am perfectly well aware that we have no power of

our own to establish gas-works without the consent of the Southport Corporation.

Sir E. BECKETT: Is there any other reason, except the anticipation of having works of your own—which you say you know you cannot have without our consent—why you object to sell us your mains.

Witness: To make sure of a safe and satisfactory supply. We have had occasion to complain both as to the deficiency in quantity and quality to a very great extent. If we had our own works we could make our own quality. I am not aware that, independently of the agreement and of the Stockport Corporation Act, there is the public law against our setting up gas-works of our own. We also want to retain power and control over our roads.

Sir E. BECKETT: You would have exactly the same power over your roads; but is it not right that we should have the power of looking after our own mains, and seeing they are in good repair?

Witness: You do that now. We never wish to prevent you.

THURSDAY, MAY 25.

Mr. LITTLER addressed the committee on behalf of the Birkdale Local Board, in opposition to the bill, and

Sir E. BECKETT was heard in reply.

The committee having consulted,

The CHAIRMAN announced their decision, to the effect that they were prepared to find the preamble of the bill proved, subject to the following conditions—that everything connected with the Corporation of Birkdale, and the promenade in Birkdale, be struck out. The committee declined to repeal generally the clauses 40 to 45 inclusive in the Act of 1871, referring to the gas arrangements with Birkdale, but they would give the proposed maximum price of gas, which was to apply equally to Birkdale and to Southport; the committee also agreed to give the powers sought for the purchase of the tramways.

Mr. POPE said, with respect to the rest of the preamble, there was nothing except the gas mains.

The CHAIRMAN said there would be no change as to the mains; they would remain as at present.

On the following day, the bill having been amended to meet the decision of the committee, the preamble was declared proved, and the clauses agreed to.

An application of the Local Board of Birkdale for costs as against the promoters was refused.

Legal Intelligence.

CLERKENWELL POLICE COURT.—WEDNESDAY, AUG. 9.

(*Before Mr.* BARSTOW.)

FRAUDULENTLY USING GAS.

Alfred Grist, of the "George" public-house, Whitecross-street, St. Luke's, was charged with "feloniously stealing 100 feet of gas, the property of John Orwell Phillips, secretary of The Gaslight and Coke Company, Horseferry-road, Westminster."

Mr. RICKETTS appeared for the defendant.

Mr. WILLOUGHBY (Willoughby and Cox), who attended to prosecute, said the present charge against the defendant was for removing a meter on his premises and attaching a pipe to communicate with the service-pipe of the company and his own fittings, by means of which he procured a supply of gas without its passing through the meter—an offence which, as the magistrate knew, had been more than once decided to be larceny. The circumstances, however, in this case were the following:—On the 7th July last the defendant commenced to be a customer of the company. On the 17th July he sent a complaint to the office of the company that there was some irregularity in his meter, and on that day the company sent and changed the meter. On the 27th of the same month, one of the company's inspectors called upon the defendant and asked to see his meter. There had been some previous conversation between the inspector and the defendant; and as they were going downstairs the defendant told him that he was afraid he had done wrong, as he had taken the meter away and substituted a pipe. Mr. Ricketts, who now appeared for the defendant, had explained to the gentleman by whom he (Mr. Willoughby) was principally instructed, what was the answer he proposed to give to the charge of felony. There was no doubt that there had been at one time some obstruction in the meter, and it would seem that the defendant, an ignorant man, removed the meter and substituted the pipe under some idea that he was not committing so serious an offence by so doing. He (Mr. Willoughby) would not enter into a further statement of the company's case, because he proposed to call the attention of the bench to the Gas-Works Clauses Act, 10 Vict. c. 15, sec. 18, in which provision was made for dealing with the removal of meters and attaching communications fraudulently, by way of penalty. The section said, "Every person who shall lay or cause to be laid any pipe to communicate with any pipe belonging to the undertakers without their consent, or shall fraudulently injure any meter as aforesaid, or shall otherwise improperly use or burn such gas, shall forfeit to the undertakers the sum of £5 for every such offence, and also the sum of 40s. for every day such pipe shall so remain, &c." In the present case he proposed, with the magistrate's permission, that the defendant should be dealt with under that section. He understood that, by the advice of Mr. Ricketts, the defendant proposed to plead guilty to the charge of detaching the pipe, and for that offence he (Mr. Willoughby) would ask for the full penalty.

Mr. RICKETTS said, in mitigation of the penalty, and in defence of his client, he might remark that the defendant had only been in possession of the premises for three weeks, and there was undoubtedly something wrong with the meter. The company indeed removed one meter, and sent him another which they believed to be in perfect order, but which did not allow the gas to pass properly through it. This could be proved by the evidence of several gas-fitters. Not being able to obtain any light, the defendant, on the 26th of July, yielding to the advice of a friend, did remove the meter and connect the pipes, and when the inspector went to the house next day he told him what he had done. Of course this was no defence, and was only stated as a matter which the bench might take into consideration. He (Mr. Ricketts) had the evidence of policemen that the defendant's house was in total darkness, and it was only because of his inability to procure light that the defendant was induced to act as he had done. With regard to the section of the Act quoted by Mr. Willoughby it was impossible to struggle against it, therefore under the circumstances the defendant would plead guilty.

The MAGISTRATE asked whether the facts stated by Mr. Ricketts were admitted, because if so they materially altered the appearance of the case?

Mr. WILLOUGHBY said they were not.

The MAGISTRATE: Then Mr. Ricketts will have to call his evidence.

Mr. WILLOUGHBY: I shall first call mine.

The MAGISTRATE: The offence is admitted, but the facts stated by Mr. Ricketts materially affect the question. You charge a roguish action which I should visit with the full penalty.

Mr. WILLOUGHBY: We cannot but treat it as a serious thing in the interests of the company, and if you think I ought to go on I shall be prepared to prove a case which I believe you would be induced to send for trial.

The MAGISTRATE: No, not after what you have stated as to taking the case under this particular section. I cannot commit for trial under that section, can I?

Mr. WILLOUGHBY: No, it is a matter for penalty.

The MAGISTRATE: You must please yourself, and take your own course. It must be quite obvious that if Mr. Ricketts's witnesses are satisfactory it is a comparatively slight offence.

Mr. WILLOUGHBY: Then I think I had better call my witnesses at once.

The MAGISTRATE: I do not think you need do so, because substantially your case is admitted. I want to know whether the place was in darkness, and whether the meter was out of order? The meter must be in existence.

Mr. WILLOUGHBY: I think this would probably influence your decision a good deal, and I speak it under correction by Mr. Ricketts. I was going to show, as part of my case, that from the 10th to the 17th July the defendant's consumption was 343 feet a day. Then, from the 17th to the 27th, which was the day the connexion was formed, the consumption was 200 feet a day; and from the 27th to the 31st, including the day when the policeman saw the house in darkness, the consumption was 475 feet per day.

The MAGISTRATE: It was not a totally deficient meter then. What ought the consumption of such a house to be?

Mr. WILLOUGHBY: It is a public-house—say 475 feet.

Mr. RICKETTS: It is a 10-light meter.

Mr. WILLOUGHBY: And the meter is in use at this moment; it has never been taken off the premises.

Mr. RICKETTS: But the valve would not work, and something had to be done to it. My client only took the house on the 10th. (To the magistrate): I think, sir, I shall leave the matter in your hands. I cannot complain of the company, who have taken the more lenient course. I can only say I have witnesses here—persons of respectability—to speak for him.

The MAGISTRATE: The defendant is fined £5 and 2s. costs, or one month's imprisonment.

The fine and costs were at once paid.

WANDSWORTH POLICE COURT.—WEDNESDAY, AUG. 9.

(*Before Mr.* PAGET.)

A POLLUTED WELL.

William Clifford, a market gardener, was summoned by the Richmond Rural Sanitary Authority to show cause why an order should not be made upon him to close a well which supplied Manor Cottages, West Fields, Barnes, with water.

The defendant was represented by his son, who said the water was not used for house purposes.

Mr. *James Adams*, the medical officer of health for the district, was called to prove that the water was unfit for domestic purposes. He said it was very foul with cesspool matter, and five or six times worse than the Thames.

The son said he should like the magistrate to drink the water.

Mr. PAGET said he would rather not.

Mr. *Adams* then produced a sample of the water in a bottle, and poured a small quantity into a glass, which he handed to the magistrate.

Mr. PAGET held it up and said the water looked very clear. He supposed, however, that if he drank the water he should be in danger of becoming a subject for the cororner.

Mr. *Adams* then proceeded to test the water for ammonia, and poured a few drops of a liquid into it. The water immediately changed to a light brown colour. After the glass had stood a short time, a thick sediment appeared of a darker colour. He said the change in the colour of the water showed the presence of sewage matter in it.

A tumbler containing water supplied by the Lambeth Company to the police station was brought in and subjected to the same test without effecting any change in the colour.

In reply to the MAGISTRATE, Mr. *Adams* said he did not know where the cesspool was situated which contaminated the well water, but the neighbourhood was full of cesspools.

Mr. PAGET adjourned the summons for a fortnight to give the defendant an opportunity of closing the well, as he was desirous of enforcing the requirements of the Public Health Act with as little inconvenience as possible.

BURNTISLAND WATER SUPPLY.—The new Act of the Burntisland Town Council provides chiefly for a better supply of water to the town, the principal features of which we may here briefly recapitulate. The present supply is from three sources, and though sometimes yielding 17,000 gallons per day to 3400 of a population, is intermittent, very inadequate, and a source of constant complaint. The new or Dour scheme proposes to add to the old supply at least 300,000 gallons per day. In accomplishing this result it will be necessary to expend about £18,000 in the purchase of land, construction of reservoirs, piping, &c. The gathering ground of the Dour extends, it is said, to 1200 acres, and the water over this area is to be collected in a reservoir covering 43 acres and capable of holding fully 90,000,000 gallons, or 130 days supply, supposing the daily output to be 700,000 gallons, the required consumption being as follows:—Burntisland, 300,000 gallons per day; Aberdour, 50,000 gallons; compensation, 350,000; total, 700,000 gallons. As evidence of the resources of this scheme, it may be mentioned that the Dour was carefully gauged for a twelvemonth—March, 1875, to March, 1876—and was found to yield an average of 1,390,000 gallons per day; the highest gauging for one day being 13 million gallons, and the lowest 54,000. When burns runs dry, the storeage supply for towns in the east of Scotland is usually reckoned for 200 days, but the half of this was felt to be a safe calculation for the Dour. In addition to the general reservoir, a distributing reservoir is to be erected, and between these the water undergoes a filtering process. The latter is 200 feet above the sea level, and the former 39 feet higher. With the combined supplies of its old and new water, Burntisland will have over 100 gallons per day per head.—*Engineering*.

COLNE VALLEY WATER COMPANY.—On Thursday, Aug. 4, the formal opening of the works of this company at Bushey took place. The works have been constructed under the superintendence of Mr. J. F. Bateman, and are intended for the supply of a large district outside the north-western boundary of the Metropolis, beginning just beyond Hampstead and Highgate, and extending to Edgware, Pinner, Elstree, and Bushey. The water is derived from a well in the chalk, at a depth of 235 feet, extending for 32 feet below the mean Ordnance level. For the first 95 feet the sides are so constructed as to be absolutely impervious to the penetration or infiltration of water that might otherwise ooze in from the upper strata, the lower part of the well consisting of a simple boring downwards into the firm chalk. The water rises to a natural level of within 8 feet of the engine-house floor. To raise it to the necessary height, two horizontal condensing engines, each working up to 60-horse power, are employed, their delivering capability being somewhere about 1,200,000 gallons per diem. The water contains 18·5° of hardness, but the company state that after being treated by Dr. Clarke's process the hardness amounts to only 3°. The water in the company's well, when the engines are at rest, rises to within 8 feet of the floor of the engine-house, or 195 feet above sea level. When the pumps are at work, drawing 800,000 gallons per 24 hours, the water sinks to a depth of 36 feet in the well, or 59 feet from the summit, equal to 144 feet above the level of the sea. After undergoing the softening process, the water is pumped up to a covered reservoir on Bushey Heath, having a capacity of 2,000,000 gallons. The lift is about 315 feet, but the elevation of the reservoir is as much as 518 feet above the sea level, or about 60 feet above the cross of St. Paul's. From this elevation a supply can be furnished by gravitation to the highest parts of the district on the north-west of London. The three softening reservoirs are so arranged that one can be emptied of its deposit while another is filling and precipitating, the third affording a supply of clear softened water for the district.

Miscellaneous News.

THE GASLIGHT AND COKE COMPANY.

Report of the Directors, to be presented to the Proprietors at the Meeting on the 25th of August.

On the 24th day of March in the present year, the day after the date of the last half-yearly report of the directors, the Board of Trade scheme for the amalgamation of the Imperial Gaslight and Coke Company and the Independent Gaslight and Coke Company with this company, having already been sanctioned by general meetings of shareholders, received the confirmation of the Queen in Council, and the union of the three companies, as from the 1st day of January previous, was accomplished.

The balance-sheet which is now submitted to the proprietors embraces the accounts of the working of the united company for the six months which concluded on the 30th of June last, and from them it will be seen that the operations of the company, extending to two-thirds of the total gas supply of London, are of such magnitude as to involve a responsibility of administration of which the directors are fully sensible.

In completion of the history of the parliamentary session now closing, with the earlier portion of which the proprietors have already been made acquainted, but little remains to be told. The altered bill which, at the instance of the Board of Trade, and with the co-operation of the local authorities, the directors have promoted in Parliament, has become law. "The Metropolis Gas Companies Bill," introduced by the Metropolitan Board of Works, and intended to apply to the whole of the metropolitan gas companies, was abandoned at a very early period of the session; and the other public measure subsequently introduced by the Board of Trade, limited in its operations to the southern side of the River Thames, was also laid aside. The withdrawal or the passing of the latter would, however, equally have left unaffected the position of this company.

From the nature of the arrangements thus concluded, it would appear to the directors, and it affords them the utmost gratification so to state, that the time has at length arrived when, having succeeded in satisfying the local authorities, they may be permitted to devote their entire energies to the development and perfecting of their system of manufacture and supply, considerable progress towards which, since the date of the amalgamation, has been already made. Large contracts have been entered into for the construction of extensions at several of the company's stations, and it will become necessary to apply to the shareholders at an early period for the funds required for their completion. The directors are also pursuing their policy, so successfully inaugurated in the year 1868, and are using every exertion to limit manufacture in the crowded portions of London, and to transfer it to localities removed from a dense population, and where opportunities for greater economy of working are afforded. Acting on this principle, they have altogether abandoned the Westminster station—heretofore one of the most important gas-making stations in London—as a point of manufacture, and are now engaged in the dismantling and removal of its plant. The ultimate disposition of the land is as yet undetermined.

Passing from manufacture to the internal management of the company, the directors have to report that, with a view to the general convenience of proprietors, they have consolidated the whole of the paid-up shares in the company (except the Five per Cent. Preference Shares, 3rd Issue, convertible at the end of the present year) into stocks, the certificates for which are now in course of distribution.

A reference to the revenue account will show that, in consequence of the numerous amalgamations which since the year 1868 have been sanctioned, the payments to annuitants and superannuated officers now amount to a very large sum annually. The directors are, therefore, engaged in the consideration of a scheme for the commutation of pensions under the table regulating the granting of annuities by Her Majesty's Postmaster General, and they anticipate much relief to the company by its adoption. The permanent staff of the company having, partly through amalgamations before mentioned, and partly from a general increase of business, attained large proportions, the directors are contemplating, among other minor matters, in lieu of the existing system of private security or assurance guarantee, the establishment of a domestic-fund for the guarantee of the fidelity of their own officers; and they entertain the hope and belief that such an arrangement will tend to the benefit of officers as well as to the security of proprietors.

Turning to the accounts themselves, the directors have to point out that all comparison with previous years is necessarily destroyed by the consolidation of the figures of the three companies recently amalgamated. They content themselves, therefore, with the simple statement that, while income is increasing expenditure is diminishing, and the result, so long as coal remains at its present price, must be to add to profits. The large outlay, however, of new capital, which perforce the company must incur, not only in providing for a manufacture transferred from disused and abandoned intra-metropolitan stations, but also in dealing from year to year with a continually growing demand for gaslight, requires the exercise of much caution. The directors do not, therefore, feel justified in immediately announcing that a reduction in their price of gas will take place from any particular date; but from the sustained and continued improvement in their station-working, they do not hesitate to express their opinion that that reduction is imminent, and the proprietors may rest assured that in their interests it will be made at the very earliest period which the funds of the company may render possible.

Lastly, the directors have to report that the result of the half year's trading enables them, after providing for payment of all preferential charges, to declare dividends at their respective parliamentary maximum rates on the ordinary and other unguaranteed stocks of the company.

(Signed) RICHARD HOWE BROWNE, Governor.

Horseferry Road, Westminster, Aug. 14, 1876.

TAUNTON GAS COMPANY.—The annual general meeting of shareholders was held on the 25th ult. The directors report stated that the quantity of gas sent out during the past twelve months was 34,656,600 cubic feet. The new works and machinery recently erected were brought into operation during the past season. The large increase of the company's business during the past year had rendered necessary further additions to and extensions of the works; among the most important of which were a new boiler, engine, and exhauster. To meet the cost of these works, and to render more adequate the working capital of the company, the directors had made a call of £1 per share on the yellow shares of 1872, payable on the 1st of August. The directors recommended a dividend of 7 per cent., to be declared payable on and after the 4th of August. The directors had reduced the price of gas to the extent of 3d. per 1000 cubic feet, commencing from June 15 last. On the occasion of the death of the late respected secretary, Mr. Thomas Fisher, the directors did not fail to express to his family their sympathy, and to record their high sense of the valuable services rendered by Mr. Fisher to the company. The directors had much satisfaction in confirming Mr. Edwards in the office of manager, and in appointing him also to that of secretary. The directors had every reason to be thoroughly and highly satisfied with Mr. Edwards's services in these combined offices. The directors had great satisfaction in announcing that, with Mr. Edwards's cordial co-operation, they had been able largely to reduce the amount of Sunday labour on the works, without in any degree diminishing their efficiency.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of July, 1876. According to these, 137,133,677 gallons, or 623,061 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 260 gallons (118·1 decalitres) rather more than a *ton* by weight, to each house, and 36·6 gallons (16·6 decalitres) to each person, against 35·2 gallons during July, 1875. According to returns of the London Water Companies made to the select committee on East London Water Bills (session 1867), it is estimated that, during the year 1866, about 82 per cent. of the total supply of water for all purposes was for domestic use; applying this proportion to the total quantity supplied daily in the month of July, 1876, it may be estimated that about 112,449,615 gallons were used for domestic purposes, or about 30·0 gallons per day for each inhabitant, against 27·2 in the corresponding month of last year. This proportion varies from month to month, but the Registrar-General has no means of giving a more reliable estimate.

Companies.	Number of Houses, &c., supplied in July, 1875.	July, 1876.	Aver. Daily Supply of Water in Gallons* during July, 1875.	July, 1876.
Total supply	519,223	528,406	122,319,068	137,133,677
From Thames	243,978	248,661	63,556,418	69,178,301
„ Lea and other Sources	275,245	279,745	58,762,650	67,955,376
THAMES.				
Chelsea	28,555	28,675	8,134,300	8,861,700
West Middlesex	47,039	48,278	10,468,138	11,996,740
Southwark and Vauxhall	80,146	80,530	19,264,250	19,800,000
Grand Junction	35,709	36,616	12,017,830	13,290,561
Lambeth	52,529	54,562	13,671,900	15,229,300
LEA AND OTHER SOURCES.				
New River	123,493	124,553	27,179,000	31,547,009
East London	107,851	110,324	24,754,950	27,718,651
Kent	43,901	44,838	6,828,700	8,689,725

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for July, 1876, as compared with that for the corresponding month of 1875, shows an increase of 9183 houses, and of 14,814,609 gallons of water supplied daily.

Dr. Frankland, F.R.S., reports, as the result of his analysis of the waters supplied to the Metropolis during July, that, taking unity to represent the amount of organic impurity (on this occasion) in a given volume of the Kent Company's water, the proportional amount in an equal volume of water supplied by each of the other metropolitan companies was—New River 1·3, West Middlesex 1·8, East London 2·0, Grand Junction 2·3, Chelsea 2·4, Lambeth 2·7, and Southwark 3·0. The summer quality of the river waters was maintained, but "those delivered by the Southwark and Lambeth Companies were markedly inferior to the others." The temperature of the samples of the river waters, as they issued from the mains, ranged from 63·5° to 70·7° Fahrenheit, thus rendering the water "vapid and unpalatable;" the temperature of the Kent Company's deep well water was only 57·2°. Under the intermittent system of supply, the temperature of the water increases considerably after it leaves the mains, and before it reaches the consumer.

YORK UNITED GASLIGHT COMPANY.

The Half-Yearly Ordinary Meeting was held on the 3rd inst.—Alderman WEATHERLEY, Chairman of the Board, presiding.

The CLERK (Mr. C. Sellers) read the following report:—

Your directors submit their report and balance-sheet for the past half year, and also for the year ending the 30th of June last, and recommend that the usual rate of dividend—viz., 5s. per share upon the old shares, and 4s. 6d. per share upon the new shares, be paid on and after the 8th inst., free from income-tax.

In the gas department the increase in consumption has scarcely been equal to the average, but the revenue has been considerably helped by large sales of tar. Your directors, however, cannot look forward for a similar result in the current half year, for in addition to having on hand a less stock of tar they have recently reduced the price of coke. At the same time the lower price at which they have secured their supply of coal may possibly compensate for these drawbacks; and if so, your directors will, before the close of the present year, consider the question of making a further reduction in the price of gas.

The remodelling of a large portion of the retorts, for the purpose of increasing the company's carbonizing power, referred to in the last report, is proceeding satisfactorily. This work, coupled with the general repairs and painting of the public lamps, and the enlargement and relaying of portions of street mains, has necessarily added to the ordinary working expenses, but your directors hope that the special work in connexion with the remodelling of the retorts will, during the present half year, be completed.

Capital and Stock Account.

Dr.		*Cr.*	
Amount of works, Jan. 1, 1876	£96,389 8 1	Paid-up capital	£95,000 0 0
Extensions—		Calls on new shares	5,000 0 0
Remodelling retorts, &c.	1,768 0 1		
Amount of works	£98,657 8 2		
Balance	1,342 11 10		
	£100,000 0 0		£100,000 0 0
		Balance	£1,342 11 10

Trade Account.

Stock on hand, Jan. 1, 1876	£3,700 6 3	Sales of fittings	£1,365 7 11
Fittings and fitters wages	1,252 7 11	„ gas, coke, &c.	18,339 4 6
Coal and lime	7,022 1 0	Goods and packages returned	10 15 6
Retorts, iron work, meters, lamps, wages, &c.	2,606 9 9	Interest received from bankers	63 10 3
Direction	300 0 0	Stock on hand this day	2,943 5 6
Salaries and stokers wages	1,849 11 2		
Rates, taxes, &c.	229 17 11		
Printing, advertising, and stationery	64 18 1		
Law	15 15 11		
Bankers charges	52 19 0		
Sales returned	64 2 7		
Discounts and abatements	2 5 5		
Bad debts	11 2 3		
Depreciation and contingent-fund	500 0 0		
Balance	5,050 6 5		
	£22,722 3 8		£22,722 3 8
Dividend payable Feb. 8, 1876	4,750 0 0	Balance in hand, Jan. 1, 1876	15,455 10 2
Balance	15,755 16 7	Balance from trade account, June 30, 1876	5,050 6 5
	£20,505 16 7		£20,505 16 7
		Balance available for dividend & working capital	£15,755 16 7

The CHAIRMAN, in moving the adoption of the report, stated that it was so

explicit in giving information on all that had been done since the last meeting of the shareholders, that few words were required from him in explanation. They would easily gather that the directors had been unusually busy with work which could not be avoided, and to which they had given their constant and close attention. They would remember that at the last half-yearly meeting the directors reported that they had replaced some of the old purifying apparatus by putting down four new and improved boxes. He had now to inform them that the working of the new apparatus was in every way satisfactory, and he need scarcely add that it had perhaps placed them in a better position, for economically and efficiently doing their work in the purifying department, than they had ever been before. The remodelling of the retorts was upon a principle which they trusted would be equally satisfactory, and which, when completed, would greatly improve their position for meeting the growing requirements of the company. He might further state that from the first commencement of the work connected with the enlargement and extension of the various parts of their machinery they had had neither hitch nor accident, which, considering the large amount of work done, he thought was exceedingly gratifying. In alluding to the general business of the company, he said that the fluctuations in the value of the different articles the company dealt in had been rather great. They had been able to obtain coals at a reduced rate. The advantage of that gain, however, had been considerably lessened by the reduction they had made in the price of coke. How long that price would continue would depend upon the state of trade, which, he was sorry to say, was at present not very promising. At the same time, however, the directors thought they would be in a position at the end of the year to give another advantage to the gas consumers by reducing the price of gas. If they were in a position to do that, it would be equally gratifying to the directors, as he was confident it would be to the consumers of gas; and he might take this opportunity of saying that, while the policy of the company was approved by the shareholders it also met with the approval of the gas consumers, and that while on the one hand the financial position of the company was maintained, the interests of the consumers were not neglected. It had been and is now the policy of the company to apply all surplus profits over and above meeting the legitimate requirements of the company to lowering the price of gas, and in that particular way the directors had every reason to believe that their policy was fully appreciated by the consumers.

The report was then adopted.

The CHAIRMAN moved a resolution confirming the recommendation in the report as to the payment of dividends.

Mr. J. T. TAYLOR seconded the motion, which was carried.

The CHAIRMAN next moved the election of the following gentlemen as directors for the ensuing year:—Alderman Brown, Mr. J. L. Foster, Mr. D. Hill, Mr. J. Holtby, Mr. W. Leak, Mr. J. Pearson, Mr. H. Sotheran, Alderman Steward, Mr. J. F. Taylor, Mr. W. Varey, Mr. R. Weatherley, and Mr. W. W. Wilberforce.

Mr. BULMER seconded the resolution. He said the pleasure he ordinarily experienced in listening to the report of the company was on this occasion considerably heightened in consequence of the unusually satisfactory character of the report itself; for whether they regarded the report *per se*, or compared it with those of preceding half-years, or went thoroughly into the figures, they could not do otherwise than come to the conclusion that its character was sufficiently clear and satisfactory to please the keenest shareholder, and silence criticism. The hope which had been expressed relative to the reduction in the price of gas they could only desire to see realized, and as speedily as possible.

The resolution having been unanimously adopted,

Mr. BULMER proposed a vote of thanks to the chairman and directors, for the labour they had expended in conducting the business of the company.

Mr. W. W. HARGROVE seconded, and the vote was heartily accorded.

The CHAIRMAN's reply terminated the meeting.

YORK NEW WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting was held on the 3rd inst.—Mr. J. F. TAYLOR in the chair.

The SOLICITOR (Mr. J. P. Wood) read the directors report, as follows :—

It will be gratifying to the shareholders to observe that there is a satisfactory increase to the revenue.

The extensions of mains referred to in the last report have been completed, and, although this will prove beneficial to the company, as a source of additional income, yet the special expenditure has absorbed a material portion of the income of the half year.

The directors recommend that a dividend of 7s. per share for the past half year, being at the rate of £7 per cent. per annum, be declared, and that the same be paid without deduction for income-tax on and after the 8th day of August next.

Your directors have pleasure in informing the shareholders that the bill promoted by this company to empower it to construct additional works, to raise additional capital, and for other purposes, has passed through Parliament, and received the Royal Assent on the 27th day of June last.

The directors feel assured that the obtaining of this Act will enable the company to meet all the future requirements of the district, and will prove of great advantage to the health and comfort of the inhabitants of the city and neighbourhood.

Under the provisions of the Act, your directors propose to ask the shareholders at the special meeting to be held immediately after the half-yearly meeting, to authorize the creation of 2000 new preference shares of the value of £10 each. These shares it is proposed shall bear a dividend of £5 per cent. per annum, and be allotted to the existing shareholders in the proportion of one new share for every four shares of the existing ordinary share capital of the company.

Dr. *Revenue Account.* *Cr.*

Stock on hand in December	£552	18	3	Balance in hand, less dividends	£1713	4 10
Stock since purchased	623	3	2	Received from the half year's water-rents	5460	7 9
Salaries and wages	571	10	2	Property rents	23	7 0
Coals for engines and offices	339	4	0	Discounts	0	14 6
Oil, tallow, candles, and waste	40	14	0	Bankers allowance for interest	12	10 6
Property rents	0	10	0	Sales of sand	16	10 4
Rates and taxes, including income-tax	144	1	7	Sales of engine ashes	4	6 0
Stationery	24	8	2	Sales of plumbers fittings	242	6 9
Printing and advertising	2	14	4	Plumbers fittings on hand June 30, 1876	71	16 1
Directors	150	0	0	Stock used since December, and on hand	1176	1 5
Auditors	2	2	0			
Legal expenses	7	0	0			
Sundry disbursements	9	4	1			
Repairs of engines	69	14	7			
Repairs and cleansing of reservoirs	224	8	0			
Repairs of mains and works generally	251	3	10			
New works—pipe laying	675	2	10			
Do. meters	84	7	10			
Interest on loans	170	14	9			
Bankers charges for commission	17	6	3			
Plumbers fittings on hand Dec. 31, 1875	114	3	9			
Plumbers fittings since purchased	160	15	3			
Balance	4485	18	4			
	£8721	5	2		£8721	5 2

The CHAIRMAN, in moving the adoption of the report, said it was a very gratifying circumstance that the income kept steadily increasing. Some of them might say that this was owing to the extensions the company were continually making to meet the requirements of the city, which was slowly but surely and safely increasing. As all the new buildings required water, their revenue was thus augmented. There was also that large undertaking, to which reference was made at the last half-yearly meeting, of laying mains to the new foundries, and that had entailed a considerable cost for pipes. That undertaking the directors felt quite sure would prove remunerative to the shareholders, for in the neighbourhood of the foundries numerous cottages had been built—in fact quite a little town—and these were supplied with the company's water, besides which the foundries also required water. He thought they might fairly congratulate each other on the fact of their new bill having been passed, and having received the Royal assent. The members of the committees of both Houses of Parliament to which the bill was referred took every pains and every endeavour to make the scheme a sound one, and the chairman of each committee expressed an opinion that the step they were taking was a proper one. He had no doubt, and he thought the shareholders would have no doubt, that the Act would ultimately be of great benefit to the city, and enable the company to maintain a constant and ample supply of pure water, as well as to make any further extensions which might be needed.

The report having been adopted, and the dividend, as recommended by the directors, declared,

The meeting was made special, for the purpose of considering the propriety of raising, under the authority of the new Act, all or any part of the capital which by that Act they were authorized to raise, and to authorize the directors to issue new shares or stock, either ordinary or preference or both.

The CHAIRMAN moved a formal resolution for carrying out that object, and raising the sum of £20,000.

Mr. WOOD, in answer to inquiries, said the allottees of new shares could not pay up the amount in full at once. It was very probable that, by the consent of the shareholders, preference shares might be converted into ordinary shares. There was no special clause in the new Act authorizing that to be done. All that the directors had power to do, with the consent of the shareholders, was the increasing of the dividend by 1 per cent. There was also power conferred upon them of converting borrowed money into ordinary capital. As to converting the new preference shares into ordinary shares, that question had better be considered, if the occasion should occur, when such a step was contemplated, and not at present.

The resolution having been adopted, the meeting closed with a vote of thanks to the chairman and directors for their services, and particularly for the successful manner in which they had carried the new bill through Parliament.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of Shareholders was held on the 27th ult. —the Rev. Dr. PHELPS presiding.

The following report of the directors was presented:—

The directors, in submitting to the shareholders a statement of accounts for the half year ending Midsummer, 1876, state that the profit and loss account shows a balance of £1433 10s. 8d. in favour of the company.

The smallness of this balance is due to the fact that very large expenditure has been made this half year in renewals of costly apparatus and works of a permanent character. The directors have, from time to time, been calling the attention of the shareholders prospectively to the necessity of these works and renewals, and provision has gradually been made—by adding the occasional surplus profits to the floating assets to supplement half-yearly balances of profit which, as in the present case, owing to extraordinary expenditure, prove inadequate to pay the full statutory dividends. The report of the managers to the directors gives a reliable assurance that the important works already executed are of the most satisfactory character.

The directors recommend that a dividend after the rate of 10 per cent. per annum for the half year, on the consolidated stock, and after the rate of 7 per cent. per annum on the first three calls, and from the 1st of February last on the amount paid in respect of the fourth call on the new shares, be paid on the 1st of August next, free of income-tax. To pay these dividends, £869 9s. 1d. must be taken from the floating assets.

The retiring directors are Dr. Phelps and Mr. Charles Balls. The retiring auditor is Mr. John Death.

The manager (Mr. James Weeks) in his report to the directors, states: I beg to inform you that, of the additions to the manufacturing plant and other works ordered by you, the following have been completed :—

1. The new gasholder. This has been thoroughly tested and is now at work. I feel sure it will be found substantial and durable.

2. The new six-inch main on the Trumpington Road has been laid, and will, when connected to the ten-inch main now being laid on the Lensfield Road, be found to fully meet the requirements of the district.

The illuminating power, pressure, and purity of the gas has been kept fully up to the required standard.

It was proposed by the CHAIRMAN, and seconded by Dr. DROSIER, and carried unanimously, "That the reports of the directors and manager, as printed and circulated, be received and entered on the minutes."

It was then proposed by the CHAIRMAN, and seconded by Mr. ALLEN, and carried unanimously, "That a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the first three calls, and from the 1st of February last on the amount paid in respect of the fourth call on the new shares, be paid on the 1st of August next, free of income-tax."

The retiring directors and auditor having been re-elected, the proceedings closed with a vote of thanks to the chair.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting of Shareholders was held on the 11th inst. —the Rev. Dr. OKES, Master of Corpus Christi College, in the chair.

The following report was submitted :—

The directors recommend that a dividend on the consolidated stock, and on the first and second calls upon the new £2 shares, for the half year ending July 6, 1876, at the rate of £10 per cent. per annum, be paid on the 1st day of September next, free of income-tax. To assist in the payment of this dividend, the sum of £169 7s. 7d. will be appropriated from the suspense account.

The 4875 new shares, recently created under authority of the company, have been offered to the existing shareholders in proportion to their present holdings, and have been generally accepted. The first call upon these shares will be made about the end of the current half year, of which due notice will be given.

The directors have entered into a contract with Mr. J. J. Headly, of Cambridge, for the erection of the new engine, boiler, &c.; and with Messrs. Roberts, of West Bromwich, for the supply of cast-iron pipes; in both instances, at a cost below the estimated amount.

The 234 unallotted £2 shares were sold by public auction on the 11th day of May last, and realized the sum of £1093, being an average of £4 13s. 5d. for each £2 share. The gross profit on the sale of the shares of £625 will be carried to the suspense account.

The engineer and manager (Mr. Henry Tomlison) reports that, during the past half year, water from the company's works has been laid on to 160 premises, the increased rental derivable from which is £121 per annum. The total number of premises now supplied is 6634.

Considerable progress has been made in the preparations for augmenting the pumping power at the company's works, and the special extensions and additions to the distributing mains in various parts of the town are now in process of execution. The general condition of the company's works is satisfactory.

The CHAIRMAN briefly moved the adoption of the report and remarked that the company were progressing so prosperously as to need but few words from him to the shareholders.

Alderman DEATH seconded the motion, which was unanimously carried.

A dividend in accordance with the terms of the report was declared, and a very cordial vote of thanks was tendered to the chairman and directors, which terminated the business.

WATER SUPPLY OF SIMLA.—It is stated that the Anglo-Indian Government have sanctioned an expenditure of £100,000 for the "sanitation" and water supply of Simla.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 208.)

Election of Office-Bearers.

The report of the scrutineers was then read. It was as follows:—President, Mr. A. Macpherson (Kirkcaldy); vice-presidents, Mr. J. Hall (St. Andrew's) and Mr. A. Smith (Aberdeen): committee, Mr. John Reid (Leith); Mr. P. Watson (Stirling); Mr. T. Whimster (Perth); Mr. J. K. Watson (Edinburgh); Mr. A. Scott (Musselburgh); and Mr. William Dunlop (Hamilton). Mr. W. Mackenzie as secretary, and Mr. Fraser as auditor, were unanimously re-elected.

Mr. Macpherson returned thanks for the honour which had been conferred upon him.

Mr. Fraser then submitted the auditors report, which was approved of.

Some discussion followed as to whether it would not be advisable to increase the annual subscription from 5s. to 7s. 6d., but this was objected to, on the ground that it might deter country gas managers from joining the Association. It was then suggested that extra-ordinary members should subscribe 10s. a year; but after some conversation, the president said he did not think this question should be pressed further in the meantime, although, he said, he would be very glad if extra-ordinary members could see their way to increase their subscriptions.

Mr. W. Key (Glasgow) read the following paper on

A READY MEANS OF ADJUSTING THE SEAL ON DIP-PIPES, AND OTHERWISE REDUCING PRESSURE ON RETORTS.

(*For Drawings, see next page.*)

Mr. President and Gentlemen,—The subject of this paper is one of the most simple that could be chosen to be brought before you. It is of a general and every-day nature, that seems at first sight to be almost trivial, and too commonplace to occupy your valuable time on such an occasion as this, and one likely to merit very little attention, and provoke no interest, from the fact that we confidently feel that we already know all about it, and consequently it can be productive of no further relief to us in our management, nor profit to our several companies.

However, in holding this opinion we may be in error, and I will try to show you how, by a careful study of the "uses" and "abuses" of our hydraulic main, we may be induced to alter our present notions, and ascribe to it an importance second to no other part of our manufacturing plant; and, also, by certain inexpensive alterations and improvements, it can be made to do duty in a manner quite equal to other machinery and apparatus presently employed to attain the same object—namely, that of relieving the retorts from pressure, and which machinery represents an enormous outlay of capital all over the world for exhauster apparatus, with ground and buildings to contain the same, and resulting in a heavy annual charge for interest, together with the annual expenses of working and maintenance; and, also, I may be able to show some reason why, in my opinion, no capital should be so spent until our hydraulic mains are first made to do their duty in as perfect and complete a manner as possible, to the relief, profit, and satisfaction of all concerned.

Before proceeding to describe the arrangements shown by the wall drawings, allow me first to show you, by this apparatus, the action of how the pressure on retorts increases and decreases, by the increase and decrease of the seal on the dip-pipes, as well as by the increase and decrease of the working pressure, composed of the pressure accumulated in working of scrubbers, purifiers, &c., and weight of gasholders.

I have here a small gasholder, which we will term the retort, and from which we will get the supposed gas. I have attached a pressure-gauge to show the pressure on inside of retort.

We have, also, a glass hydraulic main, with a glass graduated dip-pipe, and a gasholder to receive the gas from the retort. We will weight this gasholder to represent the working pressure acting on the surface of the hydraulic main, when no exhauster is in use.

We will now pass gas from the retort to the gasholder, and put various depths of seal on dip-pipes, and employ various back pressures, and observe the pressure on inside of retort.

I shall only use water to seal the dips, although I had intended to illustrate fully some of the abuses the hydraulic main is put to. I would then have employed another hydraulic main filled with tar, to show the extra pressure caused by such a seal, but in a meeting such as this it would be impossible to give the required attention without occupying too much time, to have the glass properly heated to the degree usually found in our hydraulic mains without fear of breaking it, and igniting the tar, and I therefore leave such experiment to be conducted by yourselves in your own works.

But I may here mention that I have found the pressure required to unseal a dip in tar varied from 12-10ths to 20-10ths of an inch for every inch of dip in the tar, and while the exhauster worked at level gauge.

With those hydraulic mains having the water-line and overflow fixed as shown on the drawing, and marked 1 and 2, by which the water and lighter tars flow off first, leaving the heavier tar to seal the dip-pipes, the tar left in the main will become denser the longer it is left uncleaned, and when the main is fixed in a position more favourable to pitching than in others, the pressure required to unseal the dips becomes a very serious matter.

Having shown you these actions and pressures on hydraulic mains and dip-pipes, I will now briefly describe to you the plan I have designed for the purpose of satisfying the ideas of those who still maintain that a seal on the dip-pipes, however small, is necessary at all times, and by the action of the arrangement bringing about as good results as possible by the use of a seal.

The Overflow.—You will observe by the drawing that the overflow from the hydraulic main rises up in the bottom of the main, and is a wrought-iron tube of either two, three, or four inches inside diameter. The top of this fixed tube reaches to within an inch or so of the proposed low water-line.

(By the proposed low-water line in this drawing is meant, that level when the water in the main just touches the bottom of the dip-pipes, closing them, and when the dip indicator, afterwards to be described, is represented as being at zero.)

The Dip Regulator.—The before-mentioned tube is screwed on its outer surface, and a coupling, say six inches long, is made to fit and screw easily over it, which is again attached to a rod, passing through a stuffing-box on cover of main. This rod has a wheel or lever handle, for the purpose of turning round rod for screwing up or down of the coupling, until the desired water-line is attained.

The Syphon.—On the same bar that attaches the rod to the coupling is fixed a cylinder of sheet iron, or tinned iron, about eight inches in depth, and eight inches in diameter, whereby a large and free-working syphon is formed, by which the tar is taken from the bottom of the main; and, as you observe, the cylinder reaches to near the bottom of the main, and stands about two inches above the surface of the water, moving up and down as the water-line is raised or lowered.

Thus, no water can get out of the hydraulic main until all the tar is run off to the bottom of the cylinder, and thereby the main is continually being emptied of tar, and renewing the liquor day by day.

The Dip Indicator.—The rod that raises or lowers the water-line is marked in fine-cut lines every half inch for several inches near the top, and by fixing a cast-iron or wrought-iron level bar as shown on drawing, the amount of dip or seal on the dip-pipes that are hid from view within the hydraulic main, can be read off at a glance from the outside.

The Flushing Arrangement.—A cock is shown attached to the overflow, and to the bottom of the hydraulic main, so that the liquor on the bottom of the main may be drained off at pleasure, or by being opened full, it will flush both the hydraulic main and overflow-pipes with hot water, and keep all clean. These overflow, dip-regulator, syphon, dip indicator, and flushing arrangements, all combined as one instrument, are quite safe in their action for any size of gas-works, and have been working for a number of years, the overflowing of the tar from the main before the water is entirely self-acting. Should any choke occur in the gas-works, and any extra pressure come on the hydraulic main, the water and liquor are retained in it, owing to the pressure acting on the surface of the liquor rising up in the syphon at the same time as on the general surface.

Several managers have made improvements on the method of taking the tar from the hydraulic; amongst these, I have described two, as shown on drawing, and marked 3 and 4.

No. 3 represents a very simple way of taking off the tar before the water, by fixing a bar of sheet iron across the main a little off the bottom and reaching above surface; thus the dip-pipes are meant to be sealed in water, but the water-line is fixed and unalterable.

No. 4 shows another system, whereby the tar is also taken off first, but has the improvement of being able to adjust the water-line. A valve is fixed on the overflow-pipe, which is 5 inches in diameter, and by the raising or lowering of the valve the seal on the dips can be raised or lowered, and have a range of nearly 5 inches.

And, in concluding this part of my paper, I may mention that, on fixing this apparatus on my hydraulic main some years ago, I was able to work with 5-10ths of an inch of seal on the dip-pipes, and I had no exhauster then in that gas-work. I also found in one gas-work where I fixed it, a pressure on the retorts of 18 inches, caused only by the depth of the seal in tar and the weight of the gasholder, and I feel confident that, at present, at least three-fourths of our gas-works still have 3 inches of seal on the dip-pipes, which, if reduced, as by this apparatus to as little as would safely seal the dips, the saving of that pressure caused by the dip would be equivalent to the employing an exhauster to remove the remaining or the working pressure of the works from the surface of the hydraulic main. The stuffing-box in connexion with this arrangement I have found to keep quite tight, and in an easy and greasy condition.

On making inquiries lately at several managers, on whose hydraulic mains this plan has been fixed for upwards of three years, I received replies, from which I may quote the following two:—

Mr. Samuel Black, manager of the gas-works, Alexandria, N.B., writes: "I am happy to bear my testimony to the efficient working of the apparatus put up by you in this work for lessening the dip on the hydraulic main; it has given entire satisfaction, and I may say we are troubled with little or no carbon on our retorts."

Mr. George Niven, manager of the Airdrie Gas-Works, writes: "I have much pleasure in bearing my testimony to the working of your 'Dip Regulator' and 'Overflow Arrangement' on our hydraulic main, that you put up in our works three years ago. The hydraulic main is kept as clean as if no tar had ever been in it; our joints are tight, and have much less carbon on our retorts. We can set the overflow to whatever dip we wish, from a quarter of an inch to several inches, and there is no trouble connected with it."

I will now ask your attention, gentlemen, to drawing No. 2. You will notice that the overflow arrangement is precisely the same, but the means of adjusting is by a different mechanism.

The piece of tube which raises or lowers the water-line is not screwed in this case.

But I have designed a screwing regulator as at R on drawing, whereby the amount of dip desired is regulated, in place of by the overflow-coupling shown on the other drawing.

The construction of the regulator, R, you will easily understand by the drawing.

This design may only be used on the hydraulic mains as a regulator, and when so used, the lever bar shown at A B need not be longer than from A to B, and when you have raised or lowered it to the desired water-line, all that remains to be done is to screw up and down the two screwed T-fittings, marked on drawing by T T, until the lever is securely fixed, and by screwing in the two bolts shown at S S the water level is then securely adjusted and locked.

It will be apparent to you that the amount of dip can also be altered by this screwing regulator by one-tenth of an inch at a time.

Another advantage of this arrangement is, that the manager may on any occasion flush his hydraulic main. He only requires to unlock the lower T-piece of the adjusting regulator, and pull the lever handle down, when the main will be emptied of all the liquor, either tar or water, from the bottom, and leave the surface liquor behind to occupy its place to the low-water level.

The expense of a valve or cock and connexions for flushing is thereby saved, and the whole would be ready for use for connecting and working it in the manner I am now to describe as an anti-dip arrangement, at a time when suitable fittings for working it as such in the gas-works had been established.

Anti-dip Arrangement.—We shall now consider the anti-dip arrangement as shown in the drawing.

The lever bar shown at top has a three-eighths of an inch iron rod attached to end next to retort mouthpieces; the length of this rod when pulled down is such as to hook on to one of the screwed portions of cross-bars after the retort-lid is closed.

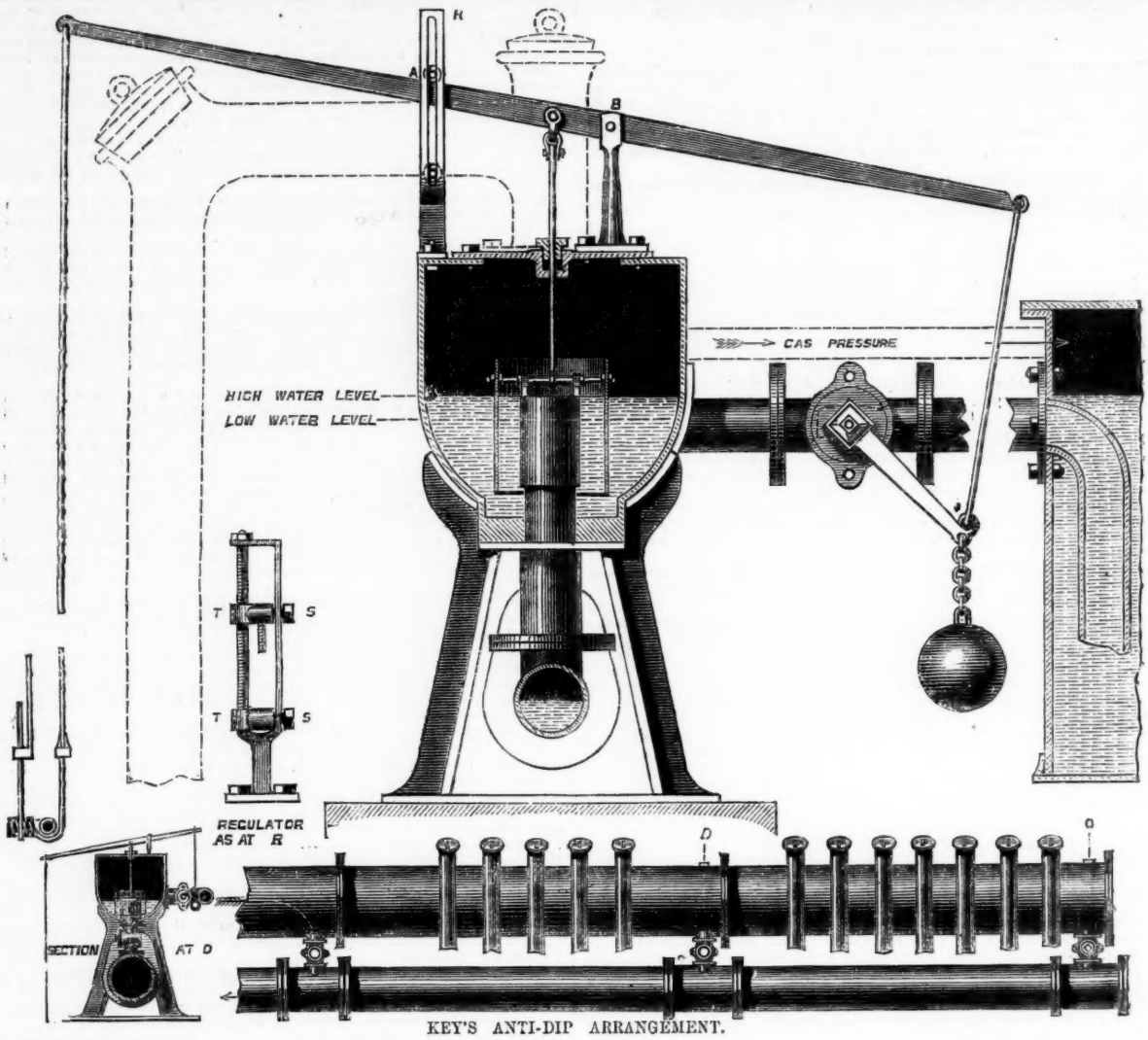
The other end of the lever is attached by a three-eighths inch iron rod to the lever handle of a cock fitted with a packing gland; this cock is 3 inches in diameter, and branched from a 3-inch or 4-inch main, running along back of hydraulic main, and parallel to it; the supply of ammoniacal liquor filling this pipe is got by its being connected to a cistern which is kept constantly at the high-water level of the hydraulic main, by a quantity of ammoniacal liquor continually flowing into it from a branch off the pipes from the pumps that supply the scrubbers, and when there is no water drawing from the cistern to retort-house the overflow simply finds its way to the underground tank again. This cistern is a closed vessel, and its outlet is turned down on inside for, say 20 inches, so as to seal it, and a pipe is taken from the retort-house gas-main and connected to it above the high-water line, so as to equalize the pressure on surface of the water in cistern with that in main for sealing the dip-pipes, and thus helping the water to flow quickly through retort-house fittings to its level in the hydraulic main. The cistern may be placed in a convenient place either on inside or outside of retort-house.

You will notice that by pulling down the rods in front of retort-bench, the stokers cannot pull it down any lower than the regulator has been set at, nor can they let it up any higher than the distance fixed by the regulator.

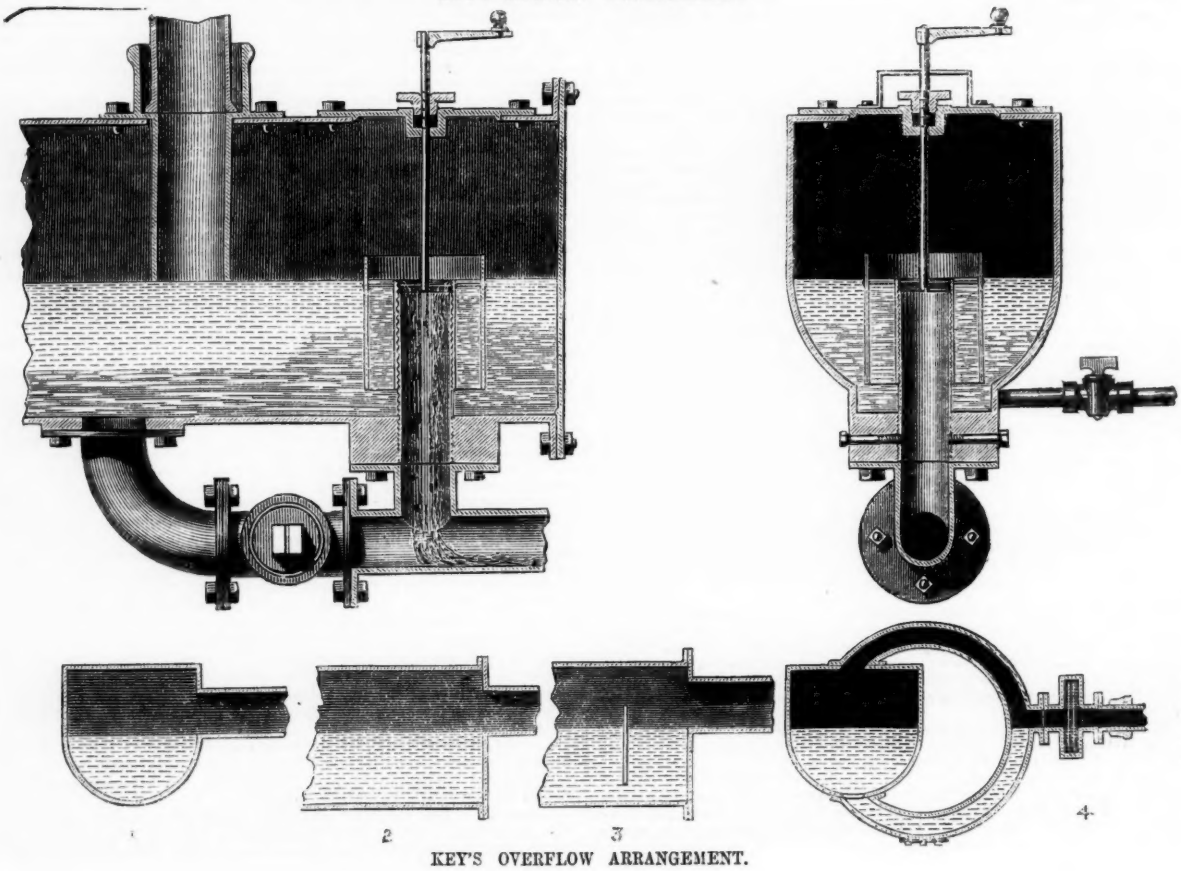
A piece of tube of the proper length is placed on the screw between the T-pieces, so that the working of the lever bar up and down may not strip the screw.

The instant the rod is pulled down the cock is shut, and the overflow tube is lowered, and the liquor flows off from the bottom of the main by the syphon. The supply of ammoniacal liquor is thus shut off, and the main is emptied to what I may term its low-water level.

I have shown that the lever on cock is weighted by a cast-iron weight or ball, so that immediately the stokers unhook the rod from the crossbar of mouthpiece the weight falls and opens the cock, and raises the overflow level



KEY'S ANTI-DIP ARRANGEMENT.



KEY'S OVERFLOW ARRANGEMENT.

in the hydraulic main; the ammoniacal liquor then flows in and fills it up, sealing the dips at the same time.

Thus the stoker, before going to slacken the screws of the lids of an oven, first lets up the rod, when immediately the dips are sealed. He then "strikes" his lids, and proceeds to "draw" and "charge."

After the whole retorts in that oven are charged, the stoker pulls down the rod and hooks it on again, when at once the dips of that oven are unsealed and the liquor runs off to the tank, in which any tar is separated from it, and the liquor is pumped up again to the scrubbers and high-water level cistern.

I have designed this apparatus in order that only one of these simple fittings be fixed on each piece of hydraulic main, the water in each length for each oven being separated by a piece of sheet iron placed in the joint, and allowing the gas to flow over it to its ordinary outlet.

By this plan, when an exhauster is working at level gauge, no pressure whatever will be on inside of retorts, or a few tenths of an inch of pressure only may be kept on at pleasure.

I have a glass model here of the arrangement with two dip-pipes, and by passing a little gas from the retort you will observe the action, which is exceedingly simple and inexpensive.

You will observe another arrangement, described on the lower part of the drawing, by a longitudinal elevation of two lengths of our ordinary hydraulic mains as presently employed, and representing one length to each oven of retorts, containing five retorts and seven retorts respectively.

I have marked, by the letter O, the position of one of this anti-dip fixtures on each length of hydraulic main, but in this case I propose that each length of main for each oven of retorts be fitted with complete blank ends before being bolted together, and by fixing, where shown, a 5-inch or 6-inch valve, all gas and liquor will pass through it from its length of main into the main shown below. By so doing, the hydraulic main for sealing the dips may in future be made a very shallow vessel, and be not more than 10 inches in depth altogether.

This latter arrangement has several advantages distinct from the others mentioned. By the shutting of a valve to a given length of main, that portion of main is entirely separated from those working, and all the ascension and dip pipes may be taken down for that oven without in any way interfering with the working of the remainder of the house on either side of it, the gas passing through the gas-main from the other retorts without interruption.

Should any repairs be required at any particular oven, or its connexions, they can be done without loss of time, or the "laying off" of any retorts but those belonging to the length of main or oven under repair, and it could at once be put on again when ready, should, at any time when there is a considerable length of main, any portion of it get out of level by the sinking or rising of ovens, and this is frequently the case when considerable damage may be done.

The seal on the dips on whole length of that main out of level can be increased or decreased very quickly, and the whole be maintained at a uniform dip throughout, as if nothing had occurred, as each length is adjusted by its own overflow.

By the flushing at every charge, all the hydraulic mains and pipes to condensers will be kept in the cleanest of order.

By the returning over and over again of the liquor, the ammonia will be extracted by the gas passing through and along wetted surfaces before reaching the condensers. The liquor will thus sooner get of sufficient strength to be disposed of. A considerable addition will thus be made to the scrubbers, as they will be materially aided in performing their work.

The retorts being thus entirely relieved of pressure when an exhauster is working at level gauge, all the benefits I am about to describe as also resulting from the adoption of the other arrangements previously described will be enhanced, and in place of a little carbon on retorts, I do not think any will be found at all.

Among the many benefits accruing from the adoption of these several arrangements, as described by the drawings, and by the foregoing, I may mention the following:—

1. That the gas manager can control the depth of seal on his dip-pipes at pleasure, and have a range of seal from zero to 4 or 5 inches.
2. By the screw motion of raising or lowering of water-line, the dip can be increased and decreased by 1-10th of an inch at a time.
3. The tar is taken from the main before the water; the main is thereby kept perfectly clean for any number of years.
4. The action of running off the tar before the water is entirely self-acting.
5. The dip-pipes being sealed in water in place of tar, the pressure on retorts, caused by a stated depth of seal, is much reduced compared with having the same seal in tar.
6. By the reduction of the pressure on retorts, they are kept almost entirely free from carbon.
7. The retorts thereby last much longer, the scurfing of retorts being generally the primary cause of retorts breaking up.
8. Much more service, and much more gas, is got from the retorts, owing to their full capacity being available all the year round.
9. The loss of wages, fuel, and plant consequent on repeated scurfings is avoided.
10. Ascension-pipes are not liable to choke.
11. The application is not expensive.
12. It is not liable to get out of order.
13. Should it get out of order, it is easily got at, and easily repaired.
14. The application of the dip indicator will also be found to be of material service.
15. Much more gas will be got from a ton of coal.
16. The gas will be of a better illuminating power.
17. Capital will be saved in the construction of works, as fewer retorts will be required to produce a given volume of gas; and a saving also of working expenses, as fewer men will be required to produce that volume.
18. All ascension, bridge, and dip pipes, need not be of a larger diameter than four inches, and, with other reductions, any extra cost for new arrangement will be entirely made up.

The conclusion I come to is this, that the majority of those gas-works having exhausters to relieve the hydraulic main of the working pressure of the works, still have a pressure on inside of retorts of from four to six inches.

Those gas-works not having an exhauster, and having a back pressure or working pressure acting on hydraulic main of four to six inches, by adopting this arrangement and reducing the seal, they will immediately be put in a position equal to the majority of gas-works at the present time working with exhausters, thereby making their works more profitable, and to represent an increased money value, at least equal to the sum paid by works of similar size for an exhauster and its accompaniments.

Well-regulated gas-works having an exhauster, by adopting either of these regulating or anti-dip arrangements, will make the hydraulic main perform work equal to the exhausters, while the amount of capital spent on exhausters would not in this case require to be employed.

Mr. MACPHERSON: In figure No. 3, Mr. Key gives a plan which, by simply putting a piece of sheet iron across the main, he gets the thick tar to pass under to the overflow. I have seen this plan adopted, and instead of facilitating the overflow, the tar got so thick that the flow ceased, the water rose and had to pass over the top, and thereby the depth was increased. Unless he can guarantee it is different with his cup than with the sheet iron, I fear the danger will be the same. In regard to plan No. 4, you would require to charge the whole of the retorts on one bench at the same time, else you would be continually opening and shutting the valve. And if you had a cracked retort you would require to have the whole bench shut off all the time you were remedying the evil, whereas by Mr. Copp's invention you can take any one of them.

Mr. REID: I have listened with pleasure to the paper which has been read. I do not know whether it is from the fact that I am an old codger, and familiar with what took place in gas-works fifty years ago, but I cannot agree with Mr. Key. In scientific lectures given in the Mechanics Institute, the dip-pipe of the hydraulic main used to be one of the most beautiful illustrations of the adaptation of a scientific principle to a necessity. The dip-pipe at that time was considered to be perfect in its fitness for the object for which it was designed. I do not think that the experience of a great many years has at all altered my opinion. I think it is objectionable to have four or five inches of hydraulic resistance offered to the passage of gas from the retort into the main; but there is no necessity whatever for that. Speaking from personal experience, I find no difficulty whatever in adjusting the lengths of the hydraulic main, because I take care not to make them too long. I usually have them about the length of this room, or say 50 feet. I put a little ridge-pipe at each junction of the main. At each ridge or partition they are adjusted so as to be from three-quarters of an inch to one inch in the liquid, so that, if there be distillation in any length of the main, that distillation is reduced to the minimum, because in every individual length there is the means of adjusting. Now I have never yet been satisfied that there is any material detriment arising from the resistance of one inch of pressure. There is no material diminution of the quantity of gas eliminated from any given charge of gas coal in the retorts. Neither do I believe that the question of getting a larger volume of illuminating gas by the application of any of these innovations has been borne out by well authenticated facts. I think the dip-pipe with partitions is very beneficial in meeting the objects which the gas manager has in view. There is absolute security from danger and accident by the return of gas into the retorts, and other contingencies that may arise, while the employment of a complicated apparatus like this is very apt to get out of order. It is liable to be neglected. If it is self-acting, so much the worse, for personal superintendence becomes personal negligence—the thing is allowed to go wrong, and some serious accident occurs. From time to time Mr. Key and others have suggested methods for discharging the thick tars from the bottom of the mains, and this is shown now in a very intelligent manner by Mr. Key. I think that has been anticipated, but if I understand Mr. Key's explanation, I would apprehend a considerable amount of danger from the employment of such an apparatus. For example, in gas-works where an exhauster is employed, it can be so regulated as to ensure a constant equality of the exhaustion, within variations that will amount to about an inch in the extreme. I should say the maximum pressure should not exceed one inch or one inch and three-tenths or four-tenths. Now if there were such a thing as this inverted cup over the discharging joint, and something were to go wrong with the engine or the exhauster, immediately a great pressure would be generated inside the main, the effect of which, if I understand it properly, would be to depress the body of the liquid in the main—

Mr. MACPHERSON: The cup is open on the top.

Mr. REID: Well, I may be mistaken. Still, I give credit to Mr. Key for bringing up the question; but at the same time I cannot see what object is to be obtained by it, or by discussions of such a system as have been going on at meetings in England. I would say it is possible to confine the resistance to one-inch pressure, and you have with the ordinary dip-pipe perfect safety. Therefore I do not see there is any ground to justify us in going out of the use and wont method of sealing and isolating the gas that is once discharged from our coal, or preventing it escaping by open retort. I think the ordinary seal attains that perfectly, and I cannot conceive, from long experience, the advantages that are to be gained by this very clever and ingenious contrivance. I do not think the object to be attained is really worth the labour and ingenuity that is displayed in meeting it. At the same time I must give great credit to Mr. Key, who has intelligently explained his views, and which coincide to a large extent with the views expressed by other members, who have been pursuing invention in the same direction; but I think they are wasting their talents in aiming at an object that really is not worth much when it is got.

Mr. W. YOUNGS (Lippens, Paisley): I am quite at one with Mr. Reid on the question as to how far pressure affects the amount of illuminating power of gas produced from a given quantity of coal. Mr. Dunlop and myself have been engaged in a series of experiments relative to the effects of pressure on the production of gas, and he has given the results to a certain extent, and these experiments I think have clearly pointed out that the effect of the pressure was not exactly that which we had previously come to believe. I think we are by far too imitative animals. It is time we should begin to try and investigate for ourselves, in order to see whether what is told us is actually true or not. We are told by Grafton that the increase of pressure increases the deposit of carbon. We are told that to increase the pressure is to increase the amount of decomposition, and we are also told that if we relieve our pressure we relieve decomposition. I am engaged in the paraffin oil trade and the oil manufacture. Now in making oil, we are told to relieve the pressure and prevent decomposition, that is to produce as great an amount of liquid product as possible, but with gas the reverse direction is given, in order to produce a large volume. One or other must be wrong. Now in order to satisfy myself, I went into these experiments, and I became perfectly convinced that an increased pressure under certain conditions was advantageous, more particularly if the temperature was low. Some of us have to produce as great an amount of decomposition in the coal as possible to break it up into gases, and in the oil retorts we have to prevent that decomposition, because we remove it from the action of heat. That is paradoxical. Further, we have some men, such as Mr. Malam, who are not satisfied with the amount of decomposition, but endeavour, by stronger heats and the introduction of carbon, to produce greater decomposition, and others again come forward with a process to remove pressure to prevent it. I am only stating facts, and I leave you to draw your own inferences. So far as Mr. Key's invention is concerned, I think it is much better to keep to the old hydraulic seal. It is the most perfect arrangement, and with the modification which Mr. Reid says he has got, I think it is perfect in every detail.

Mr. SMITH (Aberdeen): This is really most extraordinary to my mind. Mr. Key says that by removing pressure we get more gas per ton, and Mr. Young says by keeping the pressure on we have more. Now, I expected Mr. Key, as a practical man, would have come up with figures, and would have stated exactly the quantity of gas more per ton obtained if the pressure was taken off, and also that he would have given us more than mere assertion.

Mr. REID: In reply to Mr. Smith, I would like to make one observation. We all know that in volatilizing coal there is an evaporation of water. Pressure itself has a retarding influence in the production of volume, and we take it off. All that I contend for is that the amount of obstruction given by the dip-pipe is so inconsiderable that it is really not worth while adopting a complicated apparatus like this, and possibly liable to be deranged.

Mr. CLAZY (Kelso) also contended that the pressure on a pipe an inch deep in the main was as nothing.

Mr. REID: All the plans that have been suggested in regard to dip-pipes, in my opinion, are perfect nonsense, and will serve no purpose.

Mr. HALL (St. Andrew's): Mr. Reid said the division in No. 3 was an old matter. I think a seal of Mr. Key's description may be more suitable for managers of large works than for those occupying small works. I must say I have used that division for a considerable number of years; I have also used

another plan of the same construction. It was a box attached to the bottom of the hydraulic main, in order that the thickened tar below might flow off more rapidly. I have applied this, and found it a great benefit, for this reason—in small works, at certain seasons, the manufacture of gas is not continuous, and the tar gets thicker in the hydraulic main than in those works where the process of making gas goes on continuously. But I have now given up the use of this apparatus. I now use something very similar to that in the drawing, but instead of having it attached to the inside of the hydraulic main, I have it attached to the outside. I did that first, that I might lower the dip to the least possible point, and secondly, that I might clean the tar from the bottom of the hydraulic main. I attach to the end of the hydraulic main a 5-inch pipe, and outside I raise the same pipe that Mr. Key has there; but instead of having a hood over it, it is level on the top, with the means of raising or lowering it. I had an outflow, and from that outflow I have the greatest benefit, because I can wash out the hydraulic main at any time.

Mr. HISLOP (Paisley): My experience in regard to this question very much coincides with that of Mr. Reid and others. I have made several experiments to determine the real value of relieving the dip from the hydraulic main, and I adopted a plan similar to that shown on No. 4. But I demur to Mr. Key's arrangement on the other side. It is a beautiful arrangement for compensation; but to me it seems complicated, and I am afraid in practice it would not be satisfactory. I think the process we have at present is all that is required. The result is that the thick tars are removed from the bottom of the hydraulic main. Beyond that there is no necessity for anything else. The simpler the means employed the better. Any complication is a great objection. I cannot agree with Mr. Key that the adoption of his system—namely, the removal of the dip—would obviate the necessity for an exhauster. While the dip in the hydraulic main may be shallow, the resistance offered to the passage of the gas to the purifiers may be very considerable, and, therefore, I cannot see the connexion the one has with the other.

Mr. HALL (Redruth): I have listened with interest to Mr. Key's paper, although I must confess I have hardly been able to follow him through and through. It appears to me that his arrangement in regard to the dip and regularity of the overflow is too complicated. Years ago I have seen almost the same arrangement, but much simpler. The only fault that I can see in it is the fault that Mr. Reid mentioned. The fact is, that the pressure on the outside will raise the water in the inside of that apparatus, and if the man does not run immediately and raise the dip, the other pipes will be unsealed, and the gas will go back to the retorts. In regard to the anti-dip arrangement, I think the hydraulic seal is such an old friend that we ought not to give it up. It has served us well, and any alteration in that direction ought to be an arrangement outside, and altogether independent of the dip, so that if anything went wrong we would be able to work the old way. It often happens, say, in an oven of six retorts, that one of them goes wrong, and we have perhaps to work the other five for six months, and leave the sixth one shut off and out of use. Now, if Mr. Key's apparatus was attached to this oven, I do not see what we could do. My opinion is that we should have to shut off the oven altogether I have had 18 of Mr. Copp's fixed for three months, and they have given me great satisfaction, being entirely independent of the other retorts. This week, in an oven of six retorts, one of them has, unfortunately, given way, but all we had to do was to drop the valve and wire it down. Nobody, therefore, had any chance of touching it, and the remaining five worked by a separate and independent arrangement.

Mr. HALL (Berwick-on-Tweed): I have worked with the dip as low as half an inch; but after putting the pressure upon the hydraulic main, the inside of the dip-pipe had about an inch and a half of seal, which is quite sufficient to resist any pressure. I think it will work perfectly from half to five-eighths of an inch.

Mr. ROBB: There is an evil connected with all this novel invention, which has not been referred to by any speaker. Although I am quite willing to accord the greatest amount of credit to Mr. Key, and others, who have devoted much attention to these matters, yet I could not admit any invention of this kind into my works. I have no doubt I have felt the same difficulty which the managers of many other small works have experienced—namely, about Christmas time, and other festive seasons, the men get drunk, and I would like to know who is to look after this intricate machine on such occasions? We have a difficulty in getting good men to do even the commonest work about the gas-works, and I know if we were to allow men, such as we are able to get, to manage these nice intricate machines, we would be in the dark, I have no doubt, very often during the winter months.

Mr. YOUNG: If I may be allowed to reply to a remark by Mr. Smith, in reference to coming here without statistics, and making statements in regard to results from the increase or decrease of pressure, I would say I came here to state facts, and the meeting can reflect upon these facts. I may also state that I did not object to the use of the exhauster. I did not say that the use of the exhauster was valueless. I believe that where there are high temperatures it is of great utility in throwing off and preventing decomposition; but where the temperature is low, there is not the least doubt that the pressure has no injurious effect whatever. And if I may be allowed to make the further remark, I am of opinion that the question of pulsations might be taken up by members. Mr. Boyd, of Alloa, stated to me the strange fact that he could scarcely see any variation in the amount of deposition, provided there was no pulsation in the hydraulic main. At first I thought this was merely an idea; but I have come now to look at it in a different light. I commenced a series of experiments by producing pulsations in the distilling vessel. I had the idea that a different molecular arrangement was induced in the gas inside the retort, and that it produced a deposition that otherwise would not have begun. I am now satisfied that, by simply increasing the circulation in the retort, I increase the volume of gas from 10,000 to 12,000. This was perceptible on making the experiments, for you saw the gas at once move off at increased velocity; but the circulation was produced by a series of pulsations through the retort. I mention that fact, because it may be of use to the members of the Association. Then, in reference to the exhausters, although I maintain that there is no increase of yield through the use of the exhauster, there will be a lessening of leakage, which is equivalent to an increase of yield.

Mr. JAMES WHIMSTER: I suspect that Mr. Key's arrangement will choke up in the same way as No. 3 chokes up. The arrangement referred to by Mr. Hall is in no fear of such choking up, seeing the tube is kept open; and as it will have the same pressure inside as outside, there is no fear of running the hydraulic main dry. In respect of plan No. 4, I may say there is no fear of this pipe choking with pitch, because a constant stream of ammoniacal liquor is kept running in the hydraulic main, and I think that applied to any system might obviate the pitch difficulty.

Mr. PEEBLES: We are much in the same position as the philosophers who attended the court of Charles II. The king propounded the question, "How is it that a glass dish filled with water, will not become heavier if you put a fish into it?" The wise men set to work, and excellent theories were advanced by them to prove how it was that this fish did not in any way increase the weight of the globe. But some long-headed man—I suppose he must have been a Scotchman—went and made the experiment, and found that the fish did add weight to the globe. Now, in this question I join issue with Mr. Reid. I think we are fighting with a shadow when trying to demolish the dip. It is a question which I think should be settled in the same way as the philosophers settled the question of the fish—we should thoroughly understand whether the abolition of the present dip is to do any good before all these elaborate experiments are gone into. Here are clever men wasting their time, and we do not know that there is any possible result. I think a simpler plan of modifying our present dip, so as to have merely a nominal seal, would be to enlarge the area of the hydraulic main, so that where heavy pressure came on it would fill the dip-pipes of those benches which were idle, and leave sufficient water in the main to seal all the others. In regard to this arrangement of Mr. Key's, it proves that a great deal of skill, a great deal of ingenuity, and a great deal of labour, have been expended on his arrangement; but really it comes to this: Is it worth all the trouble and experiments to get rid of the dip? I must say that Mr. Key has given us a most intelligible idea of his arrangement, but then the question comes, after all: What about the fish?

Mr. REID: If the dip-pipe in the hydraulic main is inserted an inch in the water, a pressure is produced equal to one inch of hydraulic pressure, and I want Mr. Key to consider what difference is made on the distillation of the coal in the retort, by pressure produced by the dip-pipe, and by the pressure that may be produced by purifiers and other apparatus through which gas has to be sent from the retort to the gasholders. If there is any difficulty, then the employment of an exhauster gets rid of all practical difficulties which gas managers have to contend with.

Mr. KEY: I am gratified that this paper has caused a little excitement. You all know there are ten or twelve anti-dip arrangements in existence; but some people say that a dip, however small, is necessary at all times. I just designed something which might meet the views of each, so that argument might be raised to-day. The object of my paper was not to show figures or to give data, but to set the managers of small works to think whether they ought not to reduce the seal, if that were possible, and to get them to do what they can to get over the difficulty.

(To be continued.)

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

In some respects there has been a slight improvement in the state of the iron trade during the past week; but in others, I regret to have to record, the previous depression has been deepened and confirmed. In the pipe-shops of the larger foundries there is now a fair amount of activity observable, and it is reassuring to learn that the orders now on the books are likely to last some little time. There is also a moderately good inquiry for builders castings, many of which have now wholly superseded the use of stone or wood for window-heads, cornices, architraves, and other decorative portions of buildings.

Despite this slight renewal of foundry activity, however, the demand for foundry pig-iron is not by any means brisk; nor, indeed, is the demand in any degree approximate to the production, so that many of the Derbyshire smelters are sending their pigs into other districts at low rates. A very fair Derbyshire or South Yorkshire foundry pig is selling here at 54s. to 57s. 6d. per ton; commoner kinds at rather less money. Hematite and Bessemer pig-iron have been lowered in price by 2s. 6d. to 4s. per ton during the week; albeit the steel rail mills in this vicinity are doing rather more work just now, thereby creating a larger call for Bessemer pig-iron.

The ordinary merchant iron trade is almost at a total standstill, the merchants here being unanimous in stating that there has never been such an utter absence of business for twenty or thirty years. Common bars are £6 15, or thereabouts, at the works; but for a good medium bar £8 to £8 10s. must be paid, and £9 for branded qualities.

The Sheepbridge Coal and Iron Company (Limited) have declared a dividend at the rate of 8 per cent. for the year ending June 30th; a very satisfactory result, in the face of the dull state of trade all over the world.

The coal owners and merchants are even worse off than the ironmasters, and state that they have the greatest possible difficulty not only to secure orders but to get in accounts. Several small coal merchants have already been compelled to succumb, and doubtless others will shortly be obliged to do the same thing. Notwithstanding this, the development of the coal seams of the district is going on very rapidly; not less than 120 new pits being now in progress between Clayeross in the one direction and Halifax in the other. Some of these are being sunk at great cost, and are each equal to the production of 1000 tons a day when fully employed. Waggon hire from South Yorkshire to London has been reduced by 3d. per ton, both by the Midland and Great Northern Companies.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of coals of all kinds of the second class from the Tyne Dock are remarkably heavy. They would last week exceed 30,000 chaldrons. A good few of these are consigned by the collieries to the continent, no doubt. Never, probably, in the history of the coal trade were prices so irregular. Gas coals may be quoted from 6s. up to 9s. per ton, with an abundance in the market, especially of the inferior sorts. Under these circumstances an open trade will be done in gas coals during the autumn. Few contracts, except for the very best sorts, will be made. Household coals range from 9s. 6d. to 12s., and steam coal from 9s.; inferior, 11s; medium, to 12s. to 12s. 6d. best.

The wages question in Durham will come under arbitration; and as the Northumberland masters and men cannot agree with regard to the method of sorting small coals from large, the former have given notice of a reduction of 20 per cent. on the wages of the men.

The coasting freight market is very dull. Shippers may pick and choose amongst steamers at from 4s. 3d. to 4s. 6d. per ton for London, with other ports in proportion. Small sailing vessels to discharge at the wharves are not very much in request at present. The demand for France has fallen off, and the general condition of the freight market seems to predict a very shy autumn for shipping.

General manufacturing trade in the North of England is in an extremely flat state; affairs do not get settled in the Cleveland iron district as those interested in the welfare of the trade would like. There is an absence of confidence amongst commercial people, and, under those circumstances, business is restricted into as narrow lines as possible. The chemical trade does not recover from its protracted depression.

The labour market is now overstocked with men, and a good few hands in nearly all branches of trade, except house-building, are out of employment.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Most of the annual meetings of the Scotch gas companies are now over. The most recent that I have to notice is that of the Lanark Gas Consumers Company, Limited, which was held on Friday, the 4th inst. The balance-sheet for the past year showed a net profit of £737 0s. 4d. It was agreed that the dividend should be 5 per cent., that £400 should be carried to the buildings and meters account, and £168 to working capital; and it was further resolved to reduce the price of gas from 6s. 3d. to 5s. per 1000 cubic feet, and to reduce the meter-rents to 1s. 6d. per annum. The directors were authorized to renew £1500 or £1600 of bonds, and to pay off £400 or £500. After cordial votes of thanks had been awarded to the chairman, directors, and manager (Mr. Levi Monk), the meeting separated. The state of affairs now existing in Lanark in respect of the gas supply is very different from, and affords a marked contrast to, that which existed in the year 1873. In October of that year there was a net debt of £700, and it was found necessary to advance the price of gas to 8s. 4d. per 1000 cubic feet, while the gas unaccounted for was 30 per cent., whereas it is now reduced to 10 per cent.

A few days ago 30 shares, of £10 each, of the stock of the Paisley Water Company, and yielding 6¾ per cent., were sold by public auction, in three lots, at £16, £16 0s. 6d., and £16 1s. per share respectively. The upset price was £15 10s. Annuities of the Paisley Corporation Gas Trust, to the extent of £145, and yielding a return of 6¾ per cent. in perpetuity, were purchased for 160 per cent., the upset price being 150 per cent.

Dr. Wallace's report on the illuminating power of the Glasgow gas for the week ending the 4th of August, did not include the Partick gas. From none of the other three works had the gas a lower illuminating quality than 26·13 candles. The highest maximum was 29·30 candles, and the highest average 27·77 candles—both at Dalmarnock. The gas from that station was also examined as to its purity, and it showed 12·64 grains of sulphur per 100 cubic feet, and ·28 grains of ammonia.

The gas was turned on last week from the new gasholders recently erected at the Port Glasgow Gas-Works; and, "except from the fact" (says a local paper) "that the light was a little worse than usual, nobody in the town would have imagined that the Gas Committee had reached the full fruition of their hopes, and the community had been blessed with so many additional candles to the illumining power of their meters." Of course that is meant to be sarcastic; but doubtless Mr. Carlow, the manager, will be able to show the consumers by and by that he can make good gas.

The Committee of the West of Scotland Gas Managers Association have held a meeting in Glasgow within the last few days. One of the items of business was the date of the forthcoming autumn meeting of the association. It was not actually fixed, but there is a probability that it will be held on Thursday, the 28th of September.

The pig-iron warrant market has been very quiet and steady during the past week, and only a very limited amount of business has been done. A slow but steady downward movement is still expected in some quarters. Shipping iron continues but in slack demand, with large stocks accumulating. The week closed with buyers offering 56s. 4½d. cash, and 56s. 6d. one month, sellers 1½d. more. There seems to be a slight temporary improvement in the demand for manufactured iron.

No alteration as regards prices has yet occurred in the coal market, nor is there any improvement in the demand to report. There was recently a sudden demand on account of the Canadian Fleet for their second outward voyage; but the shipping department is again slacker, and it requires great pushing to obtain orders. The most recent quotations, free on board at Glasgow Harbour Cranes, are as follow:—Wishaw Main coal, 7s. to 7s. 6d. per ton; house coal, 8s. to 10s. 6d.; splint coal, 8s. to 8s. 9d.; steam coal, 9s. to 10s. 6d.; smithy coal, 14s.

MALTON GAS COMPANY.—The directors have just declared a dividend of 9 per cent. per annum.

NEWCASTLE AND GATESHEAD WATER COMPANY.—The directors have declared an interim dividend of 6 per cent. per annum for the past half year, against 5½ per cent. for the same period of last year.

BANGOR GAS COMPANY.—The directors have sent a communication to the local board, stating that for the present they defer the consideration of the proposal of the board for the purchase of their undertaking.

TAUNTON WATER SUPPLY.—At the meeting of the local board on the 1st inst. it was resolved to purchase the undertaking of the Water-Works Company for the sum of £20,000. It is intended to apply to the Public Loan Commissioners for the sum of £30,000 for the purpose of carrying out the transfer.

DISS GAS COMPANY.—The annual meeting was held on the 10th inst. The accounts showed a total receipt for the past year of £1522, and a profit of £502. A dividend of 10 per cent. was declared.

DROITWICH GAS SUPPLY.—At the meeting of the Town Council on the 11th inst., the question of the purchase of the gas-works was discussed; and it was referred to the town-clerk to consider and make a report upon the powers of the corporation to effect that object.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the medical officer of health for Birmingham, reports that the water supplied by the corporation to that town during July was "turbid," but the proportion of organic matter was lower than in June.

GLASGOW WATER SUPPLY.—Of the Loch Katrine water supplied to Glasgow during the last month Dr. Mills, F.R.S., Professor of technical chemistry in the Andersonian University, reports that it was of a pale brown colour, and contained "traces of fibrous matter and muddy particles."

REDUCTIONS IN THE PRICE OF GAS.—At Dorchester a reduction has been made from 5s. to 4s. 7d. At Leominster the price has been reduced from 5s. to 4s. 7d., to take effect from the 1st July. At Faversham the price has been reduced to 4s. 3d. and 4s., and at Grantham from 5s. to 4s. 7d. The Corporation of Neath propose to reduce the price of their gas to 5s. at Michaelmas.

ILKESTON WATER-WORKS.—The Local Board of Ilkeston have resolved to offer the water company of that town 22s. per £1 share for the purchase of their undertaking. The company some time ago were prepared to sell at 21s. per share, but since then they have expended a considerable amount of money on their plant.

COALS FOR PHILADELPHIA.—A Philadelphia paper says that an Austrian ship has been chartered to load coal at Newcastle-on-Tyne for Philadelphia, at the unprecedentedly low rate of 2s. 6d. per ton; and that Newcastle coal can be laid down in Philadelphia, owing to the low rates of freight, at 4·25 dols. per ton, currency.

OFFENSIVE TRADES AND MANUFACTURES.—At the meeting of the Metropolitan Board on Friday last, a report was brought up from the Works Committee recommending that the businesses of manufacturers of mineral acids and of ammonia, or any of its salts or compounds, from gas liquor, be declared offensive trades under the 37 and 38 Vict. c. 67, sec. 3, with a view to their being regulated by bye-laws.

ELLAND GAS COMPANY.—The half-yearly meeting of shareholders was held on Monday, the 7th inst., when the usual dividend was declared of 10 per cent. It was resolved that the sum of £5,600 borrowed on mortgage be paid off, and the amount raised by creating new shares of such amount as will conveniently allow the same to be allotted to the shareholders in proportion to the number of shares now held by them.

FAVERSHAM GAS COMPANY.—The annual meeting of shareholders was held on the 9th inst., when a dividend of 10 per cent. was declared. It was resolved unanimously that the recommendation of the directors to reduce the price of gas to private consumers to 4s. 3d. per 1000 feet, reduceable to 4s. on prompt payment, and the charge for public lamps to £4 10s. per lamp per annum, be adopted, and that such reduction take effect from the 1st July last.

PRIZE ESSAY ON THE PURIFICATION OF GAS.—The German Association of Gasmakers offer £80 for the best treatise on the method of separation of carbonic acid from lighting gas made from common coal. The method proposed must be set out at full length, with scientific explanation of its mode of action, and description of apparatus for its use on an economical working scale. Essays are to be sent in unsigned, but containing a private mark, to Dr. Schilling at Munich, before December 31st next.

ST. HELEN'S (LANCASHIRE) GAS-WORKS.—The Lighting Committee of the St. Helen's Town Council have made application to the Local Government Board for power to borrow money for the purchase of the gas-works, but the board said they could not grant the application in the face of the corporation's Local Improvement Act. Under these circumstances, the town-clerk has suggested that the works could be purchased on a rent charge of four and a half years, redeemable at any time the corporation might propose. The corporation intend to take counsel's opinion on the matter.

PLYMOUTH WATER SUPPLY.—The increase in the population and manufactures of the town of Plymouth has induced the corporation to refer to their water committee the question of the future water supply, with instructions to obtain plans and estimates of the cost of providing a storeage reservoir of sufficient capacity to obviate the danger and inconvenience to the inhabitants arising from the recurring deficiency in the corporation leat in dry seasons; and the committee, in carrying out this resolution, have been empowered to obtain such engineering advice and assistance as they may think advisable.

GAS IN IRONMAKING.—A United States paper reports that gas is used under the boilers and in all the puddling and heating furnaces at the rolling-mill of Spang, Chalfant and Co., except in two or three furnaces that have not been adapted to using gas. Before gas was introduced, 3000 bushels of coal were used daily; while now less than 300 bushels of slack coal are required. There is also a great economy in having no ashes of any consequence to be removed. The same number of heats are also made as were made with coal, and in as brief a time—in fact, the former will melt the iron in less time than the latter.

DORCHESTER GAS AND COKE COMPANY.—The annual general meeting of shareholders was held on Tuesday last—Henry Lock, Esq., chairman of the directors, presiding. The report and balance-sheet were received and adopted, a dividend of 10 per cent. declared, and the recommendation of the directors of a reduction in the price of gas to private consumers from 5s. to 4s. 7d. per 1000 cubic feet, and to the public lamps from £3 5s. to £3 met with the hearty approval of the shareholders present. The retiring directors and auditors were re-elected. Mr. John Galpin was elected to fill the vacancy on the board, caused by the death of the late Mr. Coombs, and the meeting ended with the grateful thanks of the shareholders to the directors and the manager (Mr. Osmond).

DUDLEY WATER SUPPLY.—It will be remembered that, at the Lent Worcester Assizes, the South Staffordshire Water Company were indicted for not supplying pure water to the Corporation of Dudley. Justice Field suggested on that occasion that the case might be settled out of court, and the learned counsel engaged in the case came to an agreement that a verdict of "Not guilty" should be entered, the defendants agreeing to pay prosecutors the sum of £200 for costs, and further agreeing to do what, if anything, Mr. Bateman, C.E., should say ought to be done, in order to render the supply of water to Dudley pure and perfect. The official inquiry by Mr. Bateman was opened at the Dudley Town Hall on Friday, Aug. 4, and was postponed until the 23rd inst. Meantime an inspection is to be made of the works of the company.

KNIGHTON GASLIGHT, COAL, AND COKE COMPANY.—The annual meeting of the shareholders in this company took place on Tuesday the 8th inst., Mr. W. Bowen, chairman of the directors, presiding. The balance-sheet for the year ending the 30th of June showed the receipts for the year to be £1105 4s. 1d., and the payments £857 17s. 11d., leaving a balance of £247 6s. 2d. in favour of the company, out of which it was resolved to place £100 to the reserve-fund, and to pay a dividend of 7½ per cent., which would amount to £75; thus leaving £72 6s. 2d. to be carried forward to next year's account. At the close of the meeting, votes of thanks were passed to Mr. W. Bowen, the chairman, and Mr. W. Collins, the secretary, for the interest they took in the welfare of the company.

NEATH WATER COMPANY.—At the meeting of this company in London on the 7th inst. a dividend at the rate of 10 per cent. was agreed to. The directors reported that the number of fresh services has very largely exceeded any previous half year. The Neith Water Order, 1876, enables the company to raise additional capital for increasing its storeage, by making three additional reservoirs, and other works. For this purpose it is proposed to raise £12,500, as follows:—500 ordinary shares of £10 each, limited to £7 per cent. dividend; 500 preference shares of £10 each, bearing 5 per cent. dividend, redeemable at 10 per cent. premium; £2500 four and a half per cent. debenture stock. Resolutions were adopted for converting into stock the existing ordinary shares in the undertaking.

HOLMFIRTH WATER SUPPLY.—A Local Government Board inquiry was held at Holmfirth on the 3rd inst., on the application of the Netherthong Local Board for authority to raise £1500 for works of water supply. Mr. Mellor, the solicitor to the board, stated their case, from which it appeared that the sum originally borrowed for the purpose, in 1874, was £3500, and of this sum £3379 1s. 1½d. has been expended upon reservoir and mains, leaving over £100 in hand. The cost of the works has kept within the estimates as near as possible, having only exceeded that amount by £46 10s. The board are thoroughly satisfied with the supply of water obtained, and the scheme has in every way answered their expectations. The extra £1500 is asked for in order that the board from time to time may extend their mains into various parts of the township, for laying down additional piping for water to flow into the reservoir, &c. The rateable value of the township is £7526, and the gross value £9288; the population to be supplied with water is 2500. The reservoir contains 3½ millions gallons of storeage, and the present quantity in reservoir is 30,000 gallons, and it has never been less than 20,000.

PENZANCE WATER SUPPLY.—The Sanitary Committee of the Corporation of Penzance have reported that scarcity of water has compelled them to curtail the supplies to the railway station, and that a sub-committee have carefully considered the question of existing resources. Recent rains have given a larger inflow to the reservoirs, and raised the quantity in one of them to eight feet, only two feet below the waste sill. From this one a 9-inch pipe to the town is fed. The second, and by far the larger reservoir, is dependent on two fine springs in it, which yield from 50,000 to 60,000 gallons a day, and are conveyed through a 12-inch pipe to the town. In addition to any necessary draughts on the first reservoir, there are 184,000 gallons per diem being delivered to the town, or sixteen gallons per inhabitant, as well as supplies from Leskinnick Shoot and Alverton Well. The sub-committee believe that when both reservoirs are in full working order the expectations of an ample supply which were entertained at the commencement of the present works will be realized; that the new reservoir is perfectly watertight; and that the springs in it are not injurious but healthful.

SMETHWICK GAS SUPPLY.—At the special meeting of the Smethwick Local Board on the 7th inst.—Mr. H. Keen in the chair—the solicitor having reported the passing of the Act enabling the board to purchase that portion of the gas undertaking now the property of the Birmingham Corporation, which is within the district of the local board, and having called the attention of the board to clause 7 of the Act, which requiries that the board should, within two months after the passing of the Act, give notice of their intention to exercise the power to purchase, it was moved by the chairman, seconded by Mr. Harley, and resolved "That the solicitor be instructed to prepare and deliver a notice under clause 7 of the Smethwick Local Board Act, 1876, of the intention to purchase that portion of the gas undertaking which is within the district of the local board." It was also resolved "That it be desirable, considering the present low price of iron and ironwork, to proceed at once with the erection of the gas-works required for the district; and that Mr. Bramwell, C.E., be instructed at once to prepare the necessary plans, &c., and to submit the same to the board; and, on their being approved, to obtain estimates for the execution of the works, with a view to their erection immediately."

PLYMOUTH PUBLIC LIGHTING.—At the meeting of the Plymouth Town Council on the 9th inst., Mr. Morrish proposed that negotiations should be entered upon with the gas company for a renewal of the contract for lighting the town, the present contract expiring in October next. In doing so, he thanked the gas company for their liberality to the town, and asked them to be still more liberal and to supply the gas at a cheaper rate than before. No doubt they could light the lamps at two guineas each instead of £3, and that without prejudicing the interests of a single shareholder. Mr. Watts said that if the company reduced the charge for the public lamps they must saddle the difference on the consumer, as they would have their maximum dividend. If they charged nothing for the public lamps, they must increase the price of gas so as to meet the dividends and the expenses of working the company. Mr. E. James considered the charges to the town high, and as there was a talk of lighting towns by petroleum, perhaps the Plymouth Gas Company would do something which would take the wind out of the sails of that movement as far as Plymouth was concerned. Mr. Wills said they must take the past as an indication for the future. The gas company gave £600 to the town by reducing their charges when they were not compelled to, and it was the earnest wish of the directors to give satisfaction to all. The motion to negotiate for a new contract was then agreed to.

WARWICK WATER SUPPLY.—At the meeting of the Warwick Town Council, on the 8th inst., a report was read from Mr. Pritchard, the engineer of the Haseley Water-Works, reporting that the works were progressing satisfactorily, and in a few weeks the water would be laid on to the town. The *Builder*, however, states, on the authority of a Leamington paper, that these works have again come to a standstill, the contractor having discharged the whole of his men and taken up the position of *non possumus*. This position is said to be owing to the decision of the engineer. The contractor maintains that he undertook to lay the iron main between two given points, about a mile, in accordance with the plans and sections furnished to him, which show that the main was to be laid with an uniform gradient towards Warwick. Part of this line is in running sand, at a considerable depth, of which some 350 yards remain to complete. To avoid the heavy expenses, the engineer proposes to jump over this bed of sand by means of a syphon, and orders the contractor to carry it out under the powers given to him in the contract. The contractor, it seems, disputes this power, but will carry out the work on condition of indemnification for results, and compensation for his outlay. This is the second contractor for the work who has stopped, the first contractor having done so on account of a dispute as to the price to be paid for working in hard strata. Legal proceedings are pending, a writ having been issued against the corporation at the instance of the first contractors.

KIDSGROVE GAS COMPANY.—The sixth ordinary meeting of shareholders was held on the 10th inst.—Mr. Gater in the chair. The report presented by the secretary, Mr. T. Wardle, stated that the company had during the past year reduced the price of gas 6d. per 1000 cubic feet in the new district, and there had been an increase in the consumption of half a million cubic feet. This increase applied to both old and new districts. It also appeared that many of the mains, being too small, had been replaced by larger ones, in order to increase the supply. This particularly applied to Market Street. The mains were said to be in a thorough state of repair, and the gas presumably good—seeing that no complaints had been made. There had been an application from the local board of Audley as to taking the gas there; but this was considered such a large undertaking that they could not advise it at present. They should in a very short time have to put up a new retort house, and also a new gasholder, which would cost a deal of money. In fact, at the rate they were going on, and the probable increase in the demand for gas, they would eventually have to pull down the whole of the works and build larger ones. In answer to an inquiry, the chairman said that, as soon as they saw their way clear, the directors would be pleased to lower the price of gas, not only in Kidsgrove but in all the district. The report was unanimously adopted, and a dividend of 10 per cent. declared. The retiring directors and auditor were severally re-elected, and the proceedings closed with a vote of thanks to the chair.

BOURNEMOUTH GAS AND WATER COMPANY.—The Annual General Meeting of shareholders was held at the offices, Nicholas-lane, London, on Friday last, when the following report was received and adopted:—"The directors are able again to congratulate the shareholders on the working of the company during the year ending 30th June, 1876. The receipts have increased by 22 per cent. over those of the preceding year; and, but for the necessity of charging a considerable portion of the cost of the recently-erected works to revenue as renewals, the profit and loss account would have also shown a large increased profit. The extensive additions in progress and contemplated in the reports of 1875 and 1876 have been nearly completed. The new holders, scrubber, purifiers, coal stores, and other buildings have been erected; the exhauster house alone, in the gas department of the company's undertakings, remaining unfinished. The engine for working the new pump in the new well will be at work in a few days: the water is now being pumped into the receiver by an agricultural engine. The extension of the town, however, is so rapid that, to keep pace with its increased requirements, a second main to supply water must be laid. The retort house will have next year to be enlarged, and other minor additions to both the gas and water-works be made. From the necessity of providing works to meet the extension of the town for several years in advance, the expenditure on capital account has become out of proportion to the present revenue. The directors therefore recommend that for the last half year the dividend should be at the rate of 8 per cent. per annum on the original shares, and 7 per cent. on the B shares; but they are, however, satisfied that the proper relative proportions of revenue to capital will shortly be re-established by the increasing rental. The directors propose that in future there should be two ordinary meetings every year, as provided by their local Act.

BIRMINGHAM CORPORATION GAS SUPPLY.—At the meeting of the Birmingham Town Council on the 1st inst., a long report was submitted from the Gas Committee. After dealing with many matters of detail, the committee state that considerable progress has been made in the rearrangement of mains within the borough, so as to afford a better supply of gas and regulate the pressure, thus lessening the waste from leakage. The total length of mains taken up had been 18,000 yards. There had been relaid, old mains, 10,281 yards; new mains, 8259 yards; total, 18,540 yards. During the same period of six months 1995 service-pipes were removed or enlarged, many of them being found in a very decayed condition. The whole cost of these extensive alterations and substitutions would be borne by current revenue, and would greatly add to the efficiency of the future supply as well as to the profits of the undertaking. The number of new services supplied during the quarter ended the 30th of June had been 500. The sale of gas for the quarter ending June 30, 1876, was 415,156,000 cubic feet, as against 383,740,000 cubic feet for the corresponding period of 1875, being an increase of 32,416,000 or 8·46 per cent. The sale for the half year being 1,306,219,000 cubic feet, as compared with 1,241,735,000 cubic feet in the first six months of 1875, an increase of 64,484,000 feet, or 5·19 per cent. The average illuminating power of the gas for the half year ending the 30th of June, according to the engineer's reports was 17·35 candles at Saltley, and 16·36 candles at Windsor Street, being an average of 16·85 candles, or nearly two candles above the statutory obligation. The committee regretted that one of the collectors, who had been for some years in the service of one of the companies, had been guilty of defalcations amounting to £452 6s. 6d., which amount had been repaid by the Guarantee Society. These defalcations had been going on for some years, but were discovered in the first quarter's collection under the new system of check adopted by the Corporation. After obtaining information from a variety of sources, and full and careful consideration, the committee had decided upon establishing a superannuation fund for the officers and clerks in the gas department. Rules had also been compiled, printed, and distributed among the staff. It was proposed to establish a sick and funeral allowance fund for the workmen, and this matter was now under consideration.

GAS EXPLOSION AT BIRMINGHAM.—The *Daily Post* gives, the following particulars of an explosion of gas of an alarming and destructive character which occurred on Monday evening, Aug 7. at the residence of Mr. Thomas Westley, brassfounder, in Albion Street. The gasmen in the employ of the corporation had been attaching the service-pipe at Mr. Westley's house with the new main in the street, and in doing so disturbed a pipe connecting the service-pipe with the meter in the cellar of the house. The result was that the gas poured in full force into the cellar. About half-past six o'clock Mrs. Westley was about to go into the cellar with a lighted taper to fetch up some ice required by an invalid daughter, when the gas was ignited and exploded with tremendous force, wrecking the house from roof to basement. Mrs. Westley was severely burned about the face and arms, but, owing to the door interposing between her and the flame, fortunately escaped with life. The ignited gas, in its attempt to find a vent, forced its way through the ceiling of the cellar into the drawing room above, and after driving the wall of that room outwards for several inches, ultimately lifted the roof of the bay window bodily out of the framework, the *débris* falling into the room, and the valuable drawing-room furniture being damaged or destroyed. Almost simultaneously with the explosion in the cellar, another explosion occurred in the dining room; and the gas, tearing along the ceiling of the room, dashed out through another bay window, splintering the glass to atoms. A sister of Mr. Westley, who was writing at the time, had the glasses knocked out of her spectacles, and sustained injuries by which she has since been confined to her room. The force of the explosion traversed the rooms of the second story, and passed upward to the attics, dilapidating the walls and roof, and finding an outlet through the attic window. The house is considered to be irreparably shattered, the damage being estimated at several hundreds of pounds. The explosion, which was heard for a considerable distance, attracted a large number of people, many of whom rendered assistance. There were six persons in the house at the time, and they had only recently quitted the drawing room. If the explosion had happened a little earlier, there would have been a lamentable loss of life as well as destruction of property. The officials of the Corporation Gas-Works were informed of the occurrence, and the house has been visited by the engineer and other gentlemen. Mr. Westley states that a short time prior to the explosion he had called attention to the smell of gas in the house, and one of the workmen promised that it should be attended to.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

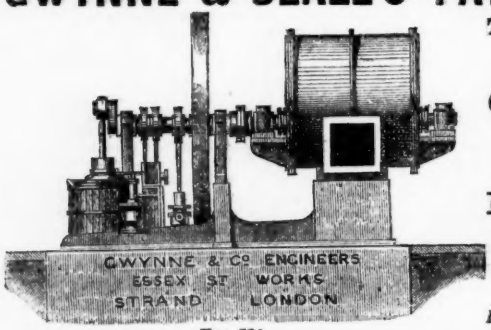


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

GWYNNE & CO.

HAVE MADE THE

LARGEST AND MOST PERFECT

EXHAUSTING MACHINERY

Ever produced, and the most economical in working.

Prices and every information on application.

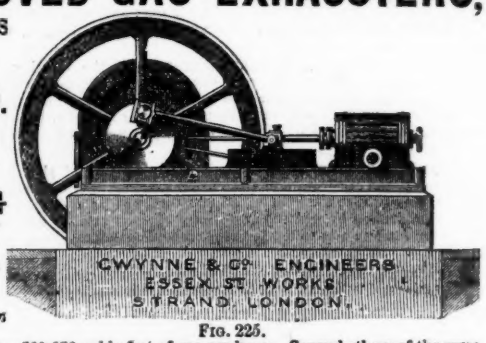


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

WANTED, in a provincial Gas-Work, a good DRAUGHTSMAN. Capable of preparing detail plans and specifications of buildings, &c. Must be able to level. One from an architect's or builder's office preferred.

State age, experience, references, and salary required, to No. 290, care of Mr. King, 11, Bolt Court, Fleet Street, London, E.C.

WANTED, an engagement as Assistant ENGINEER by a Gentleman aged 26. Thoroughly understands the manufacture and distribution of gas, the manufacture of sulphate of ammonia, the testing of gas for illuminating power and impurities (quantitively). Is a good draughtman and has had first-class experience in the construction and erecting of Gas-Works on the most approved principles.

Address No. 291, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Manager and Collector, who thoroughly and practically understands the manufacture and distribution of gas, the laying of mains and services, fixing meters, taking indices, collecting accounts, and all other duties appertaining to the office. He will be required to devote the whole of his time to his duties. Security will be required for £300. The make of gas is about 7 millions per annum.

Applications, accompanied with recent testimonials, and stating salary required, must be sent addressed to the Chairman, Dartmouth Gas, Coke, and Coal Company, Coombe, Dartmouth.

GASHOLDER MEN WANTED.—Apply to W. C. Holmes and Co., Whitestone Iron-Works, Huddersfield.

THE Advertiser, aged 26, requires a situation as FOREMAN or Manager in a chemical works. Seven years practical experience in the manufacture of Sulphate of Ammonia on the most improved system.

Address No. 286, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A GENTLEMAN, residing in Spain, wishes to have the AGENCY of a Gas-Fitting Manufacturer, Piping, and Apparatus to produce gas on small scales. He will be glad also to obtain, on commission, concessions for lighting of towns.

Address A. B. C., care of Clayton and Co., 17, Bouverie Street, London.

Advantages of Gas for

COOKING AND HEATING.

HINTS ON GAS BURNERS, &c.

By **MAGNUS OHREN, A.I.C.E., F.C.S.**

Specimen Copy by post Threepence, direct from Magnus Ohren, Gas-Works, Lower Sydenham, London, S.E.

ON SALE—One square Station-Meter, made by West in 1866, to register 8000 feet per hour, with 8-in. valves, bye-pass, &c., now in use and in good condition.

Apply to J. and J. Braddock, Globe Meter-Works, Oldham.

BRITISH ASSOCIATION OF GAS MANAGERS.

VISIT TO BECKTON, JUNE 15, 1876.

PHOTOGRAPHIC GROUPS OF MEMBERS (about 300 in each Picture), taken on the above occasion, can be had at 3s. 6d. each, post free.

Stamps or Post-Office Orders to

F. WELLS, BARKING, ESSEX.

GASHOLDER COLUMNS FOR SALE, cheap and good, twelve in number, about 30 ft. high, diameter near base 2 ft., near cap 1 ft. 6 in., with moulded caps and bases, guide-rails, and brackets complete, and suitable for a gasholder about 90 ft. diameter by 30 ft. deep.

Offers for same, delivered at St. Helen's Railway Station in Lancashire, to be addressed to Mr. James Hall, Manager, Gas-Works, St. Helen's, Lancashire.

THE Swansea Gaslight Company have for immediate SALE, the following Plant:—

A 6-h.p. Patent Trunk Engine. (Beale.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Beale.)
Exhauster to pass 15,000 feet per hour. (Beale.)
An 8-h.p. Grasshopper Engine. (Easton and Amos.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Easton and Amos.)
Exhauster, 20,000 ft. per hour. (Beale.)
Tar, Liquor, and Water Pumps, Eccentrics, Shafting, and Driving Pulleys.
Wrought-iron Condenser, six vertical Legs, 30 ft. high, 24 in. by 6 in., with tar-boxes, dips, and syphons.
Wrought-iron Scrubber, 5 ft. diameter, 20 ft. high.
Cast-iron Scrubber, 3 ft. diameter, 20 ft. high.
A set of four cast-iron Purifiers, 12 ft. square by 5 ft. deep, with galvanized wrought-iron covers, lifting apparatus, four tiers of wooden sieves, 10-in. connexions and valves.

May be seen at the Gas-Works, Swansea. The whole in perfect working order; replaced by plant of larger dimensions.

Further particulars may be obtained on application to Mr. Thornton Andrews, Swansea.

WIDNES WATER-WORKS.

THE Widnes Local Board invite Tenders for the supply of about 370 tons of 18-in. Cast-Iron WATER-PIPES, lead joints.

Specifications may be obtained at the Engineer's Office, Public Offices, Widnes.

Tenders, endorsed "Pipes," and addressed to the Chairman of the Gas and Water Committee, to be delivered at the above Offices not later than Ten a.m. upon the 4th of September.

The Board do not bind themselves to accept the lowest or any tende

Henry Roberts.

Public Offices, Widnes, Aug. 8, 1876.

WIDNES GAS-WORKS.

THE Widnes Local Board invite Tenders for the purchase of the GAS TAR and AMMONIACAL LIQUOR produced at their works, for a term of twelve months from the 1st of October next.

Tenders, endorsed "Tar" or "Liquor," as the case may be, and addressed to the Chairman of the Gas and Water Committee, to be delivered at the above works (where conditions of contract may be obtained) not later than 10 a.m. upon the 4th of September.

The Board do not bind themselves to accept the highest or any tender.

Henry Roberts.

Public Offices, Widnes, Aug. 8, 1876.

THE GASLIGHT & COKE COMPANY.

NOTICE is hereby given that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office, on FRIDAY, the 25th inst., at Twelve o'clock (noon) precisely, to transact the usual business, including the declaration of a Dividend for the half year ending on the 30th day of June last.

Notice is hereby also given that at such meeting the Directors will apply to the Proprietors for authority to raise by the creation and issue of Debenture Stock, such amounts of money as may be required from time to time to pay off the existing mortgages of the late Imperial Gaslight and Coke Company (now amalgamated with this Company).

By order,
John Orwell Phillips, Secretary.

Chief Office, Horseferry Road, Westminster, S.W.,
Aug. 9, 1876.

THE MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

Incorporated by Act of Parliament, 1867.

NOTICE is hereby given that the NINETEENTH ORDINARY HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of this Company will be held in the Board Room at the Works, Mitcham, in the County of Surrey, on TUESDAY, the 29th day of August, 1876, at Three o'clock in the afternoon precisely, to declare a Dividend for the half year ending the 30th day of June, 1876.

The Transfer Books will be closed from the 14th until the 29th inst.

By order,
Benjamin Green, Secretary and Manager.

Board Room, Mitcham, Surrey, Aug. 10, 1876.

GAS SHARES TO BE SOLD, in a country Gas Company, incorporated by Act of Parliament. Apply to W. L. Ramsden, 11, Fitzwilliam Street, Huddersfield.

GAS APPARATUS FOR SALE.

THE St. Helen's Gas Company have for SALE the following APPARATUS, viz.:—

One Set of Vertical Condensers, consisting of 10 lengths of 14-in. pipes, 20 ft. high, with H-pipes, syphons and syphon-boxes, hydraulic valves, and bye-pass mains (12-in). All complete, and now standing as when in use.

Two 12-in. Hydraulic Valves.
Two 12-in. Bye-pass Valves.
Two Wash Vessels, 8 ft. by 3 ft. by 2½ ft. deep, with all requisite connexions.
One 9-in. Hydraulic Valve.

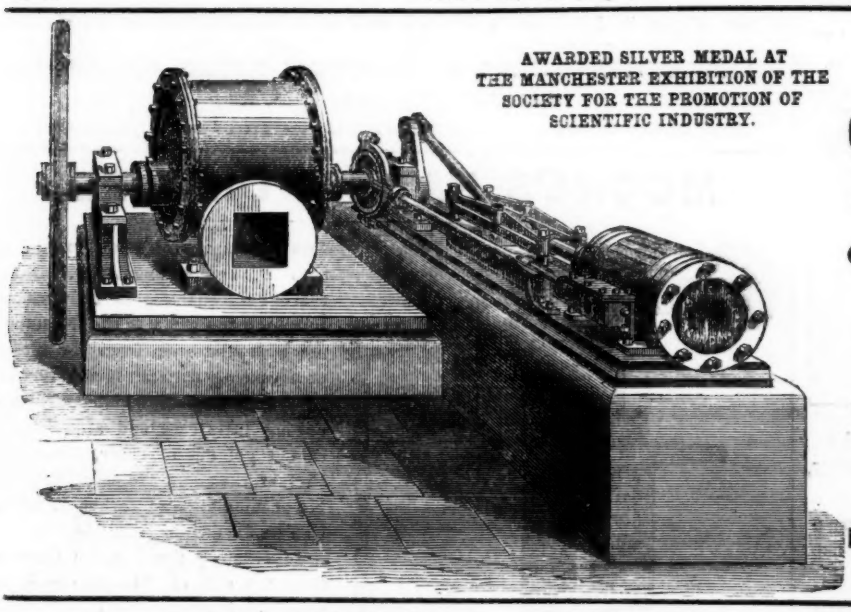
May be seen at the Gas-Works, St. Helen's, and all particulars relative thereto may be had on application to the Manager, Mr. Joseph Hall.

Will shortly be ready, price 18s., bound in cloth, lettered,

THE TWENTY-SEVENTH VOLUME
(JANUARY TO JUNE, 1876.)
OF THE
JOURNAL OF GAS LIGHTING, WATER SUPPLY, AND SANITARY IMPROVEMENT.

CLOTH CASES, GILT LETTERED,
For binding Vol. XXVII., may now be obtained, Price 2s. 6d.

London:
WILLIAM B. KING, 11, Bolt Court, Fleet Street, E.C.



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BEALE'S
Improved Patent
GAS-EXHAUSTERS
WITH
ENGINES COMBINED.

Sole Makers,
GEORGE WALLER & CO.

Makers of
ENGINES, EXHAUSTERS,
INDEX and DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, and other PUMPS,
SCRUBBERS and PURIFIERS,
CONDENSERS, BOILERS, &c.

PHŒNIX ENGINEERING WORKS,
HOLLAND STREET, S.E.,
AND
STROUD, GLOUCESTERSHIRE.

D. BRUCE PEEBLES & CO.,
ENGINEERS,
FOUNTAINBRIDGE WORKS, EDINBURGH,
MANUFACTURERS OF **WET AND DRY GAS-METERS;**
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,
ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S.E., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

THE Directors of the Sheffield United Gaslight Company require the services of an intelligent and energetic MAN to assist the Manager in the commercial department of the Company. Age from 30 to 40. One with experience in the working of Gas Companies would be preferred.

Applications, stating age, salary required, and references, must be addressed to the Chairman of the Company not later than the 27th inst.

THOS. ROBERTS, Manager.

Gaslight Offices, Sheffield, Aug. 12, 1876.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the REPAIRS of Wet and Dry Gas-Meters.

Terms of tender can be had on application to Mr. Woodall, the Engineer.

Tenders to be addressed to the Chairman of the Gas Committee, Town-Clerk's Office, Town-Hall, not later than Thursday, the 17th inst., endorsed "Tender for Repairs—Meters."

The Committee do not bind themselves to accept the lowest or any tender.

By order,
C. A. CURWOOD, Town-Clerk.

Leeds, Aug. 4, 1876.

HALIFAX CORPORATION GAS-WORKS.

TO IRONFOUNDERS.

THE Gas-Works Committee invite TENDERS for the construction and fixing at the Halifax Gas-Works of a Horizontal Screw CONDENSER.

The drawings may be seen, and copies of the specification and forms of tender obtained, on application to Mr. Wm. Carr, Manager of the Gas-Works.

Tenders, endorsed "Tender for Condenser," must be sent to me on or before Thursday, the 24th inst.

By order,
A. C. FOSTER, Town-Clerk.

Town-Hall, Halifax, Aug. 1, 1876.

TO TAR DISTILLERS, &c.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the surplus TAR produced at their works at Kingston, from the date hereof to June 30, 1877. Quantity about 80,000, more or less. Tenders to be at per gallon, f.o.b. the Contractor's barge at Kingston.

Further particulars may be obtained from Mr. Packham, Manager at the works, where a copy of contract may be seen.

Tenders to be sent to Mr. W. A. Fricker, Secretary, Gas Offices, Church Street, Kingston, on or before the 28th of August inst., endorsed "Tender for Tar."

The Company do not pledge themselves to accept the highest or any tender.

By order,
W. A. FRICKER, Secretary.

Gas Offices, Kingston, Aug. 15, 1876.

TENDERS FOR GAS COAL.

THE Directors of the Holyhead Gas Company are prepared to receive TENDERS for the supply of the best GAS COAL, in such quantities as may be required up to June 30, 1877, and June 30, 1878, respectively. The probable quantity being about 1200 tons per year.

The Coal may be tendered for screened or unscreened, to be fresh, and properly free from stones, pyrites, and all impurities.

Tenders (with analysis) stating the particular name of the seam, and locality from which the Coals are offered to be supplied, price f.o.b. at Garston Docks, or delivered per railway at Holyhead, must be delivered on or before Aug. 26, 1876.

The Directors do not bind themselves to accept the lowest or any other tender.

JOHN HUGHES.

Castle House, Holyhead.

PATRONIZED BY THE ROYAL ARSENAL, WOOLWICH.

FERGUSON, Builder and Contractor. Kite method of Repairing Church Spires and High Chimneys. Chimneys straightened, pointed, and hooped. Old Chimneys pulled down by a process requiring no scaffolding or stoppage of work, by competent workmen, under personal supervision. For Lightning Conductors—cheapness and method of fixing—apply to C. R. FERGUSON, 12, Canal Road, MILE END.

THE Vale of Neath Dinas Fire-Brick and Cement Company, Limited, Pontwalby Works, Glyn Neath, South Wales. Manufacturers of the Celebrated Genuine Dinas Fire-Bricks and Cement for Siemens's Regenerative Gas Furnaces, Bessemer Converters, Copper Smelting, Roofs of Puddling Furnaces, Glass-Works, Gas-Works, Coke Ovens, and processes involving intense and long-continued heat. Prices and estimates on application.

London Agency, 11, Queen Victoria Street, City.

W. GARDNER AND CO.,
STEAM SAW MILLS,
13 WHARF, MACCLESFIELD STREET NORTH, CITY ROAD,
Makers of
WOOD SIEVES FOR GAS PURIFIERS,
ROUND OR SQUARE, PARALLEL OR BEVELLED.
CHEAPEST IN LONDON.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.

T. BUGDEN, Manufacturer,
79, GOSWELL ROAD, LONDON, E.C.

Now ready, Second Edition, price 7s., by post 7s. 3d.,
THE
GAS MANAGER'S HANDBOOK.
By THOMAS NEWBIGGING, A.I.C.E.

Orders to be sent to the Publisher,
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11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

GEORGE ORME & CO.,
ATLAS METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
STATION-METERS, GOVERNORS,
PRESSURE AND EXHAUST REGISTERS,
LAMP-METERS IN CAST-IRON BOXES,
And every Description of Gas Apparatus.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
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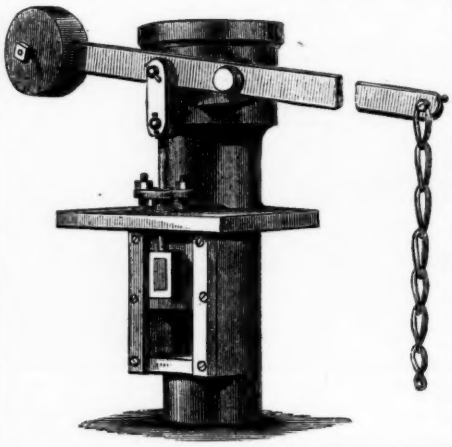
STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

MOORE'S PATENT DIP-PIPE.



THE advantages of this Dip will be seen from the engraving. It is thoroughly effectual in its working, removing the whole of the pressure of the hydraulic main from the retort, thus causing a great saving in gas. It is very easy of manipulation, requiring little care and attention; it cannot get out of order, and, when shut, works as an ordinary Dip-Pipe. No accumulation of carbon in retort. Can be fixed to existing H-pipes.

In ordering the Dip, the distance from top side of hydraulic main to water-level should be stated; also the Dip at which it is required to work when the valve is shut.

PRICES—3-in., 35s.; 4-in., 42s.; 5-in., 48s.

SOLE AGENT: J. GILL, GAS-WORKS, BRIDGENORTH,
To whom all communications should be addressed.
MAKERS: THE COALBROOKDALE COMPANY, SHROPSHIRE.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

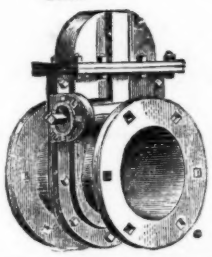
AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

B. DONKIN & CO.'S IMPROVED GAS-VALVES

TRADE MARK.

WITH WROUGHT-IRON PINIONS,



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
ALSO SOLE MAKERS OF
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GENERAL ENGINEERS AND IRONFOUNDERS,
MAKERS OF STEAM-ENGINES,
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LONDON, S.E.

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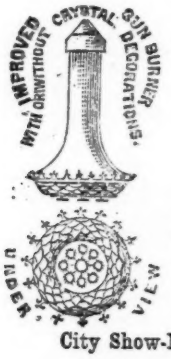
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

WORKS: LONDON AND BIRMINGHAM.



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Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1876, are now complete.

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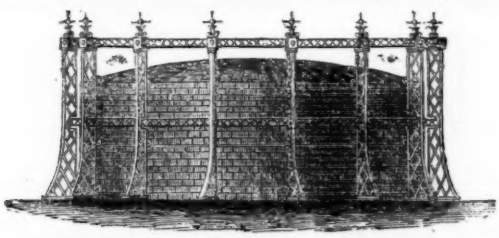

THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

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GAS ENGINEERS, IRONFOUNDERS, &c.,

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AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

JOHN DEPLEDGE,

Inventor of the

DRY-FACED CENTRE-VALVE FOR PURIFIERS,

GAS AND HOT WATER ENGINEER,

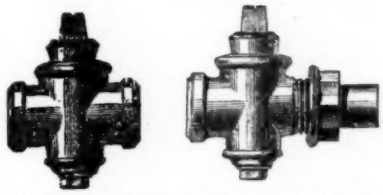
20, BRIDGEHOUSES, SHEFFIELD.

LAMBERT'S CAST-IRON GAS-MAIN COCKS,

WITH PATENT WHITE METAL PLUGS.

TRADE (L) MARK.

No. 758. No. 759.



The bodies of these Taps are made of iron, black or galvanized, and the plugs of patent metal. They are warranted not to set fast or corrode, as do Iron or Brass Cocks; will always work easily; are strong, well made, durable; of little or no intrinsic value, and therefore not likely to be stolen; and the prices as stated below are (especially upon the larger sizes) fully 50 per cent. less than Brass Cocks.

	½	¾	1	1¼	1½	2-inch.
No. 758, with inside screws for iron pipe, black	2/0	3/0	4/4	6/6	7/6	12/0 each.
No. 759, with union on one end screwed inside for iron pipe, black	2/9	3/10	5/4	8/0	9/0	15/6 each.
Nos. 758 and 759, galvanized	0/3	0/4	0/6	0/8	0/10	1/4 extra.

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SHORT STREET, LAMBETH, LONDON.

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WORKS:

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WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

(ESTABLISHED 1851.)

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only before use to be thinned down in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

PRICES and TESTIMONIALS on APPLICATION.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
5, NORFOLK STREET, MANCHESTER.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

TO INVENTORS AND PATENTEES.
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
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J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
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GOWTS BRIDGE WORKS,
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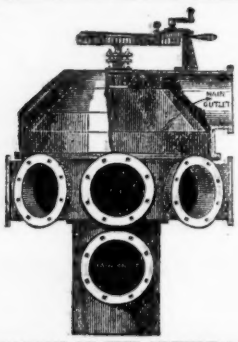
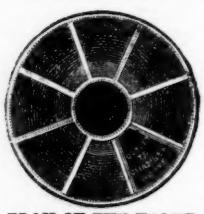
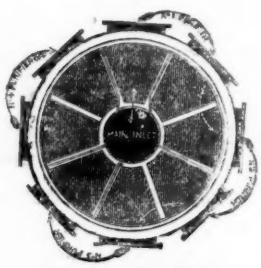
ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—It is most particularly requested that all Communications be addressed to the FIRM ONLY, as circumstances have arisen which render this necessary.

C. & W. WALKERS'
PATENT CENTRE-VALVES.


ELEVATION OF THE CENTRE-VALVE.


PLAN OF THE VALVE.

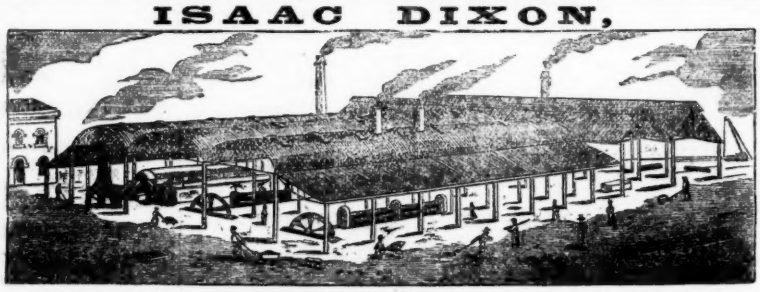

PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS. DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

ISAAC DIXON,

WINDSOR IRON-WORKS, LIVERPOOL.



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DIXON'S CELEBRATED SELF-SUPPORTING IRON ROOFS are specially suitable for Forges, Rolling-Mills, Iron-Works, Shipbuilding Yards, Mines, Collieries, Gas and Water Works, and for general purposes.
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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

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SOLE LICENSEES FOR

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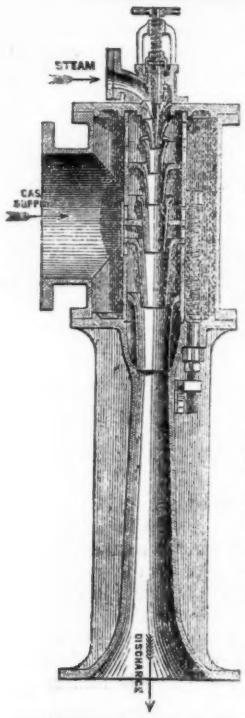
7 and 17, LANCASTER AVENUE, MANCHESTER.

Germany: Cellerstr. 35, Hannover. Austria: Kolring., Pestalozzigasse 6, Vienna. France: 11, Rue Louis-le-Grand, Paris. U. S.: 1645, N. 10th St., Philadelphia.



E. KÖRTING'S PATENT
STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 200 IN USE.

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Liverpool Gas Co.	Leyland Gas Co.	Nantwich Gas-Works.
Bolton Corporation.	Stalybridge Gas-Works.	Enniskillen Gas-Works.
Horsham Gas Co.	Lincoln Gas-Works.	Hanna, Donald, and Wilson, London.
Epsom and Ewell Gas Co.	Birmingham Gas-Works.	
Ipswich Gas Co.	Wakefield Gas-Works.	Ratcliff Gas-Works.
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	&c., &c., &c.	

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

W. CLELAND'S PATENT STEAM SCRUBBER,

Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

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OR TO

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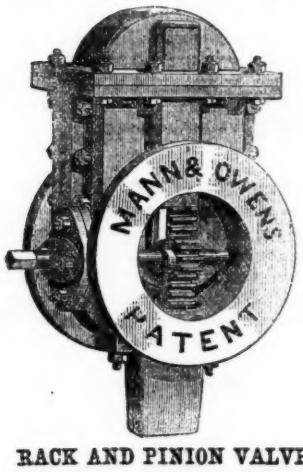
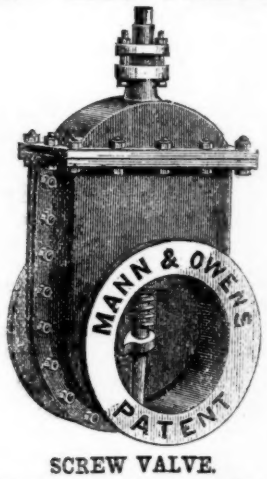
SOLE AGENT FOR ENGLAND AND WALES.

MANN & OWENS' PATENT GAS-VALVE.



RACK AND PINION VALVE.



SCREW VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

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PLUTONIC CEMENT,

For Repairing Gas-Retorts in Action, preventing Porosity, and reducing the Deposit of Carbon, is highly commended.

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Price, as engraving, with
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With bow-handle . . . . 16s. 0d.

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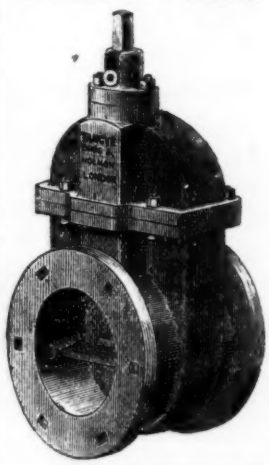
IMPROVED

GAS-VALVES.

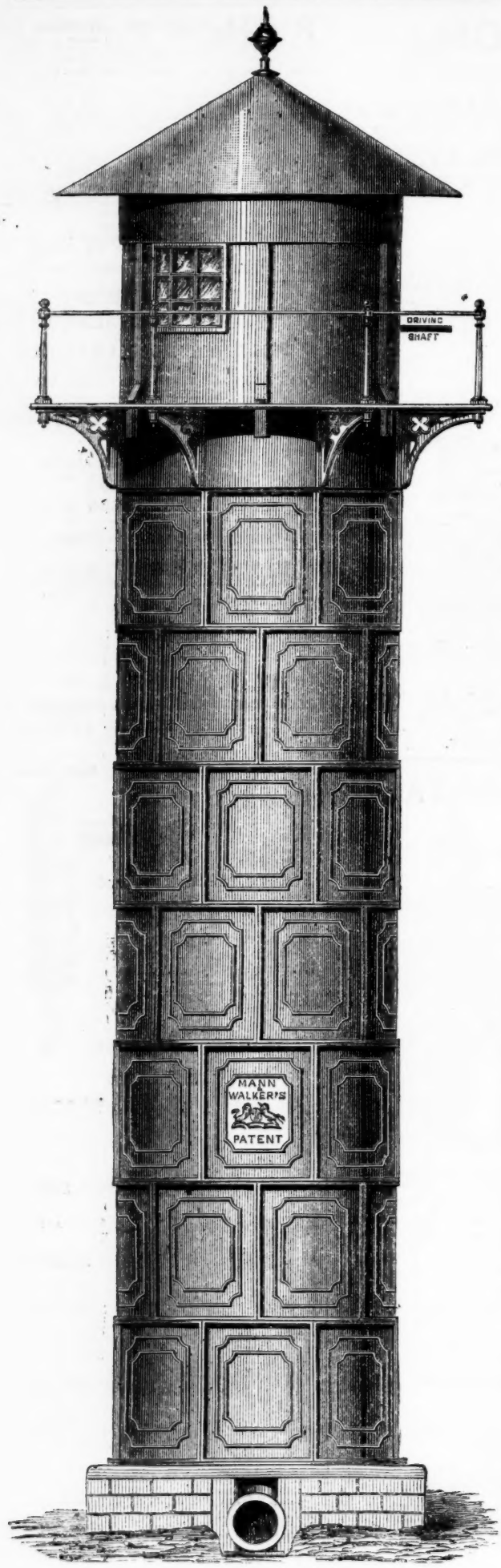


SIZES AND REDUCED PRICES ON APPLICATION.

TANGYE BROS. & HOLMAN,

LAURENCE POUNTNEY LANE,

LONDON.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us. C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

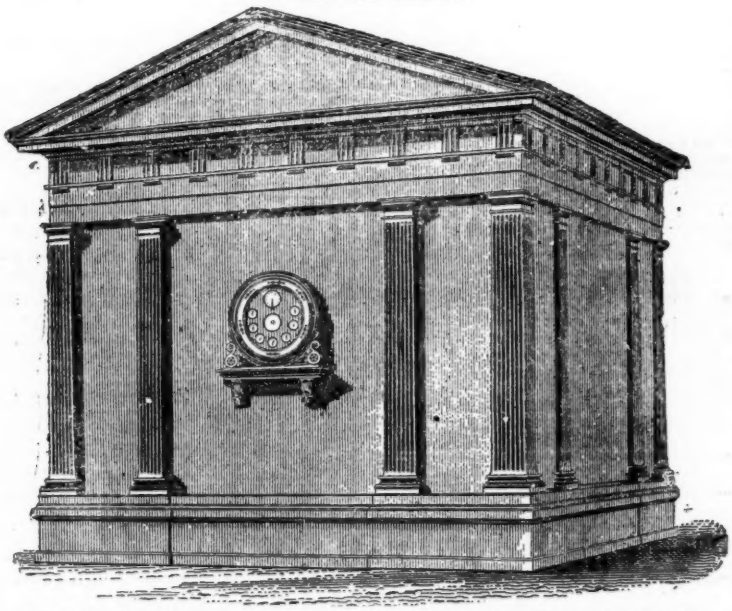
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

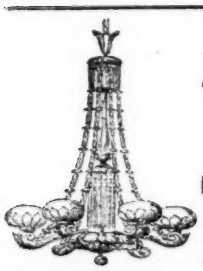
GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.



F. & C. OSLER,

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MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

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PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES.

FUEL-MACHINE, for Compressing Breeze and Tar.

WASHERS, SCRUBBERS, and PURIFIERS, that Economize Space and Cost.

N.B.—Pamphlet, with Eighteen Illustrations of the foregoing, with letterpress on the construction of Gas-Works, post free, 2s. 6d.

TROTTER, HAINES, & CORBETT,

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FIRE CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

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Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE,

BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;

And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

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THE GAS CEMENT WORKS,

BIRKENHEAD.

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(ESTABLISHED MORE THAN 15 YEARS,)

THE ORIGINAL MANUFACTURER OF

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

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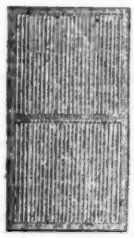

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WOOD SIEVES,

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MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

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18 & 20, ALSTON STREET, GLASGOW.

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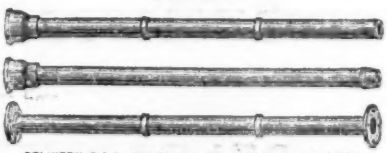

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Prices on application.

CATOPTRIC LAMPS.

The NEW PATTERN

Is now placed throughout CHEAPSIDE.

For Terms of Licence to Use and Manufacture, apply to

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LOTHIAN'S CANNEL
Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL
Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL
Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
CHARLES HORSLEY, Agent.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS,
&c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
SCOTSWOOD-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17⅝ candles.
One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
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HEBBURN MAIN GAS COALS.

Cubic feet of Gas yielded per ton . . .	10,050
Illuminating power in sperm candles . .	15·4
Yield of coke per ton of good quality . .	13½ cwts.

THE TYNE COAL COMPANY, LIMITED, OWNERS.
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CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
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SCOTCH CANNEL COALS.
The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
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Established 1840.

THE
FRAMWELLGATE COAL COMPANY,
DURHAM,
Are prepared to supply their
SCREENED AND NUT GAS COALS.
This Coal yields 11,000 cubic feet of gas and 13½ cwts. of coke per ton.
OFFICES: ROYAL EXCHANGE, MIDDLESBROUGH.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
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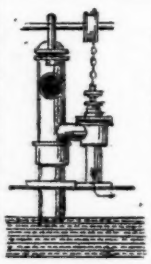
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Agent in London, MR. J. MANWARING, 101 CANNON Street, E.C.

COPP'S PATENT ANTI-DIP GAS APPARATUS.



Produces from 10 to 20 per cent. more gas of higher illuminating power.
Prevents the deposit of carbon.
Retorts last much longer.
Charges work off quicker.
This simple invention has been in use in many works for the last six months, with the above results.

PRICE 2 GUINEAS EACH.

Testimonials and particulars on application.
Address **WALTER L. COPP,**
WATCHET, SOMERSET.

G. J. EVESON,
GAS COAL MERCHANT,
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Delivery per Rail to any Part.

THE WIGAN COAL & IRON COMPANY,
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Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.
N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known
HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.		Illuminating Power in Candles.		Coke per Ton of Coal used.		Ash in Coke, per Cent.		Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	....	15·85	....	12·66 cwt.	....	6·0	....	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY,

LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

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CLASS II.

This Paint having been in general use over fourteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

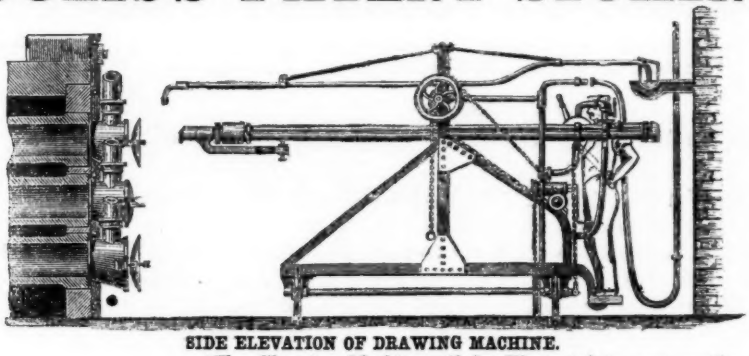
It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.

END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

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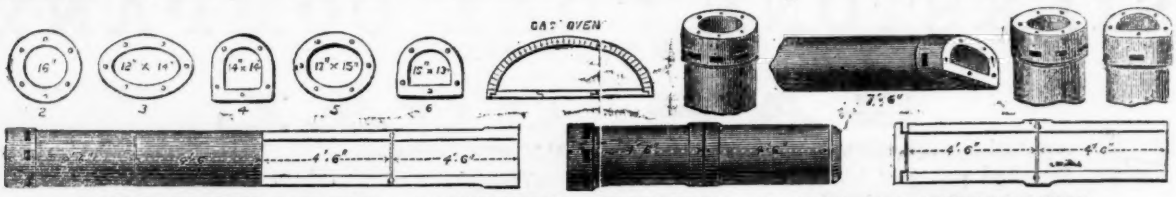
HARRIS & PEARSON,

FIRE-CLAY AND BRICK WORKS, STOURBRIDGE.



GAS-RETORTS, LUMPS, TILES, & FIRE-BRICKS,

OF EVERY DESCRIPTION.

A LARGE ASSORTMENT OF GAS-RETORTS IN STOCK.

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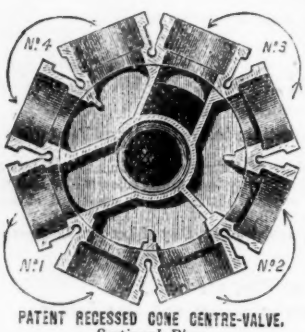


PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

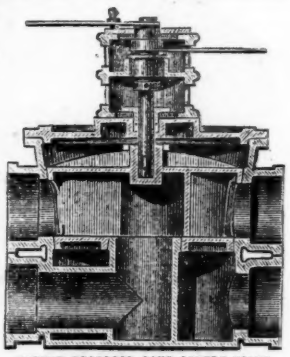
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

LONDON OFFICE: 106, CANNON STREET.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR

Invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

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DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;

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D. HULETT'S IMPROVED SERVICE CLEANSER

for clearing out Mains, Services, and Interior Fittings—70s. net.

Boyle's Patent Silvered Glass Combination Reflectors and Outside Lanterns.

Sole Manufacturers of Church and Mann's Photometer.

Large Pattern-Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 15, 1876.